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SAUK PLAN

WATERSHED PROTECTION AND FLOOD PREVENTION

PLAIN-HONEY CREEK WATERSHED

Sauk County, Wisconsin



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WATERSHED WORK PLAN
PLAIN-HONEY CREEK WATERSHED
Sauk County, Wisconsin

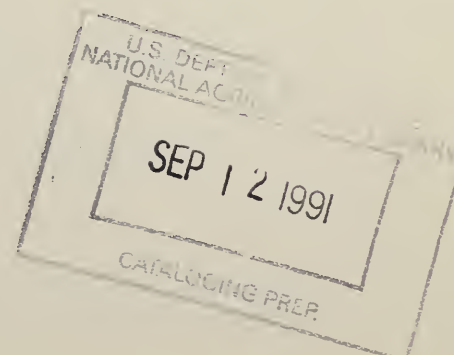
Prepared Under the Authority of the Watershed
Protection and Flood Prevention Act (Public Law
566, 83d Congress, 68 Stat. 666), as amended.

Prepared by: Sauk County Soil and Water Conservation District

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service
U. S. Department of The Interior, Fish and Wildlife Service
Wisconsin Conservation Department
Plain-Honey Creek Watershed Association
Wisconsin State Soil and Water Conservation Committee
Agricultural Extension Service

June 1965



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Sport Fisheries and Wildlife

U. S. Forest Service Work Plan for Forestry Program
on Plain-Honey Creek Watershed, Wisconsin

WATERSHED WORK PLAN
PLAIN-HONEY CREEK WATERSHED
Sauk County, Wisconsin

June 1965

SUMMARY OF PLAN

This work plan has been developed to provide for watershed protection, flood prevention and a public recreational development in Plain-Honey Creek Watershed, Sauk County, Wisconsin.

The Sauk County Soil and Water Conservation District is the local sponsoring organization and prepared this work plan with the assistance of the Plain-Honey Creek Watershed Association. Technical assistance in preparing the plan was furnished by the Soil Conservation Service and Forest Service of the U. S. Department of Agriculture, the Wisconsin State Soil and Water Conservation Committee, Wisconsin Conservation Department, Agricultural Extension Service, and the Fish and Wildlife Service of the U. S. Department of the Interior.

Plain-Honey Creek Watershed, entirely in Sauk County, Wisconsin, has a drainage area of 45,500 acres or 71.1 square miles and is within the "Driftless Area" of Wisconsin. The watershed is a part of the Upper Mississippi Drainage Basin and empties into the Wisconsin River about five miles below Sauk City.

Frequent and serious flood damages to agricultural lands, roads and bridges are the most urgent watershed problems in need of correction. Flood damages to the village of Plain are less serious but interrupt the economic growth of the community. Land damages and depreciation from upland sheet erosion are not spectacular but are more persistent problems in the area. There is a need in this watershed for a public water-based recreational development.

Since the formation of the Sauk County Soil and Water Conservation District in 1941, some 131 of the 243 farm units in Plain-Honey Creek Watershed have district agreements and an additional 10 farmers have started conservation practices on their farm units.

Land treatment and structural measures are proposed to alleviate the floodwater and erosion problems of the watershed farms and the community of Plain.

Proper land use and conservation treatment are basic elements in watershed protection and flood prevention. Land treatment measures consist of stripcropping, conservation cropping systems, diversions, waterways, pasture improvement, tree planting, sustained yield management, and the construction of ponds and gully control structures. Such measures

will reduce upland sheet erosion, increase the infiltration of runoff into the soil and better the economic status of the community and individuals.

The estimated installation cost of land treatment measures is \$81,272, of which \$13,028 will be borne by P.L. 566 funds and \$68,244 will be borne by other funds.

The proposed structural measures consist of three single purpose floodwater retarding dams, one multiple purpose floodwater retarding and public recreational site, 3.75 miles of channel improvement, and 0.27 mile of protective dike.

The recreational and floodwater retarding structure site will have a land area of 1,093 acres which includes a 104-acre lake. Recreational facilities are planned for utilization of land and water resources.

Estimated installation cost for structural measures is \$986,331, of which \$692,967 will be borne by P.L. 566 funds and \$293,364 will be borne by other funds. The State of Wisconsin will allocate to the State Soil and Water Conservation Committee \$118,000 to assist in the purchase of lands and construction of the multiple purpose dam. Other funds from the State, administered by the Wisconsin Conservation Department, will be used to defray the other cost for an access road into the recreational site.

The installation of all works of improvement, both structures and land treatment, will be accomplished during a five-year period.

The Plain-Honey Creek project will provide flood protection to agricultural lands, transportation facilities, and the village of Plain.

Plain will receive 100-year flood-free protection. An additional flood plain area of 898 acres will receive five-year frequency flood protection. Approximately 135 farm units will be benefited. The computed recreation-use at the multiple purpose structure is 50,680 man-use days per year.

The average annual cost of the structural works of improvement is estimated to be \$49,396. The average annual benefits are estimated to be \$100,303. The benefit-cost ratio for the project is 2.0 to 1.00.

The Sauk County Soil and Water Conservation District has formally agreed to accept the responsibility and provide funds for the operation and maintenance of all structural works of improvement. The estimated average annual operation and maintenance cost is \$17,084.

DESCRIPTION OF THE WATERSHED

Physical Data

Plain-Honey Creek Watershed, with a drainage area of 45,500 acres or 71.1 square miles, lies in southwest Sauk County, south-central Wisconsin.

The watershed is roughly L-shaped--about 15 miles long and four to five miles wide.

To the north the watershed is bounded by the Little Baraboo River, to the east by North Branch Honey Creek, to the south by Wilson Creek, and to the west by Bear Creek and Little Bear Creek.

Plain-Honey Creek lies within the "Driftless Area" of Wisconsin and is a part of the Upper Mississippi River Drainage Basin. The area is in late youth or early maturity, with relatively narrow finger-like ridges, remnants of a rolling upland, steep V-shaped valleys in the upper tributaries and a broad alluvial filled valley on Honey Creek proper.

The headwaters of Honey Creek are from 1,180 to 1,200 feet MSL along the northern watershed boundary. Honey Creek flows southeast to east through the watershed and has numerous small tributaries. Some 16 miles from the northern headwaters Honey Creek joins North Branch Honey Creek near the village of Witwen at 780 feet MSL. The creek then flows southeast and south to empty into the Wisconsin River near Sauk City at an elevation of 730 feet MSL.

Thirty-one percent (14,200 acres) of the watershed is considered as woodland. Manageable woodland acreage is 8,450.

Grazing evidence was observed in 72 percent of the stands. Changes in land use have reduced the woodland area exposed to grazing by livestock to 52 percent.

Timber types within the watershed are oaks with some mixed hardwoods. Some areas contain limited amounts of aspen.

Fishery resources have depreciated since stocking of streams with trout was discontinued about 10 years ago. The flood plain downstream from the evaluation reaches contain marsh and limited potholes suitable for wildlife.

The main stem has a good permanent flow supplied by numerous springs and seeps. Many small upland tributaries are intermittent. The lower valley flood plain is somewhat swampy with seepage from the base of the valley slopes.

The source of domestic water supply is ground water except for a few springs which supply small farm units. Stream water is used only for livestock.

Soils in Plain-Honey Creek are dominantly gray-brown podzols derived from the weathering of bedrock, windblown silt, and alluvial and colluvial deposits.

Major soil types on the flood plain are the Boaz, Ettrick, and Genesee silt loams; alluvial undifferentiated land; and peat and muck over silt, clay, or sand.

Terrace soils include Bertrand, Chaseburg, Curran, Jackson, and Judson silt loams, and Boone sand and sandy loam.

Lower valley slopes and upland soils are mostly Fayette, Gale, and Hixton silt loams; deep, shallow, and stony Dubuque; and rough broken land.

The majority of soils are in hydrologic group B.

The watershed has a humid continental climate with wide extremes of temperature. The coldest month is January with an average temperature of 18° F. July, the warmest month, has an average temperature of 74° F. Length of growing season is close to 150 days. The average annual precipitation is about 31 inches, and occurs mainly during the growing season. Winter precipitation as snow averages 25 inches.

Economic Data

The economy of Plain-Honey Creek Watershed is mainly agricultural. General diversified farming, with major emphasis on dairying, predominates. In 1959 slightly over 91 percent of the cash farm income in Sauk County was obtained from the sale of livestock and livestock products, and the remainder from the sale of crops.

The county's gross farm income from dairy products alone was \$9,897,000 in 1959. This exceeded gross farm income from dairy products in 1950 by 32 percent and in part reflects the expanding fluid milk market in Madison and Baraboo. Other gross farm incomes from farm products sold in 1959 were livestock, \$6,274,000; poultry and eggs, \$1,629,000; and crops, \$1,682,000.

Farming is the largest single source of employment in Sauk County and utilizes about 26 percent of the labor force. For the State of Wisconsin as a whole, only 11 percent of the total labor force is employed in agricultural production.

All land in Plain-Honey Creek is in private ownership. Land use is as follows:

| | <u>Acres</u> | <u>Percent</u> |
|----------------------------------|--------------|----------------|
| Cropland | 17,400 | 38.3 |
| Pasture | 11,750 | 25.8 |
| Woodland | 14,200 | 31.2 |
| Other (urban, roads, etc.) . . . | 2,150 | 4.7 |
| | <hr/> | <hr/> |
| | 45,500 | 100.0 |

Of the 243 farm units in the watershed 131 are cooperators with the Sauk County Soil and Water Conservation District and 98 have basic farm plans. There are 21 non-cooperators that have installed land treatment measures.

The average farm size in 1959 was 104 acres with 84 acres of cropland. Small farm units are gradually being incorporated with large units because of technical advances and mechanization in agriculture. The trend in farm tenancy is downward. In 1954 about 17 percent of the farm units in Sauk County were rented. In 1959 farm tenancy had declined to 12 percent. Current trends indicate a further decrease in farm tenancy with part-owner operators being a factor in this change. Part-owners are those operators who rent or lease land in addition to that which they own.

Baraboo and Madison, Wisconsin, are within commuting distance of the watershed and many residents of the watershed are employed in these cities. The 1960 census indicates a greater trend toward more farmers working away from their farms. From 1950 to 1959 farm operators in Sauk County who worked off their farms 100 days or more increased 16 percent.

The watershed has an excellent road net of county and town roads. County Trunk G very closely approximates the western margin of the watershed. County Trunk B crosses east to west in the southern part and State Highway 23 enters the watershed from the south and passes through the northern portion of the watershed.

Plain, with a population of 677, is centrally located in the watershed and is an important business center for area farmers. A feed mill and a lumber yard depend largely upon patronage by watershed farmers.

WATERSHED PROBLEMS

Floodwater Damage

Floods in Plain-Honey Creek Watershed have caused extensive damage to pasture, crops, roads and bridges. Livestock have been drowned and fences destroyed. Residential and commercial properties in the village of Plain and community recreational facilities have been damaged by floods.

Extensive floodwater damages occurred in 1911 and 1936. Local residents, when interviewed, have mentioned 15 large floods since 1934. Through field observation, interviews, and flood routing analysis, we know that small damaging floods occur annually.

One long-time resident in the watershed tells of the 1911 flood when a wall of water three or four feet high came down the main valley sweeping everything before it. Livestock became entangled in the fences and many small animals were drowned.

For most men in the active farming group the 1936 flood was the worst--with much of the grain destroyed, livestock drowned, and fences swept away. Joe Brickl, a farmer living northeast of Plain, recounts putting a boat into the water just below his buildings and rowing over to Plain--a distance of $1\frac{1}{2}$ miles--without a fence to bother him.

In the area to be benefited by works of improvement there are 2,596 acres of flood plain subject to inundation with an annual gross crop income estimated at \$155,000. Land value of this acreage is estimated at \$630,000.

The estimated value of some 22 bridge and road locations subject to flood damage is \$650,000.

In the village of Plain the estimated value of facilities that could be damaged by floods--lumber yard, feed mill, community swimming pool, and equipment storage yard--is \$460,000.

The average annual floodwater damages in the watershed are estimated at \$30,417.

Major floods occurred in 1911 and 1936. Since 1934 the watershed has had 15 large floods. Inundation of low lying areas on the main stem of Honey Creek may occur from three to five times during the growing season.

Frequent flooding prohibits the full utilization of many acres of fertile land. Only 1,437 acres of flood plain land are now cropped. The remaining area consists of 1,086 acres of pasture and 73 acres of roads and urban area.

Sediment Damage

Deposition of sediment--mostly silt--occurs on the flood plain, roads and in the channel of Honey Creek. From the standpoint of soil fertility, the silt is not particularly damaging, but in pastured areas up to eight cow-pasture days may be lost to dairy herds following each flood.

In connection with attempts at past channel straightening, sediment has flushed downstream to accumulate as a channel plug deposit because of inadequate downstream channel capacity.

Erosion Damage

Upland sheet and gully erosion are not considered to be serious problems. Generally, excellent cover is maintained in the upland areas. More than 50 percent of the upland acreage is covered by a land treatment program, but additional acreage needs to be protected.

Problems Relating to Water Management

Public water-based recreation and associated facilities for full enjoyment of all vacationers is a factor of local and regional importance at nearby Devils Lake and other lesser developed county and state parks. A need for additional public water-based recreational facilities can be partially satisfied by developing water resources for the specific purpose of recreation.

Recreational facilities available within a 25-mile radius are Devils Lake State Park, Tower Hill State Park and the Dells--a highly commercialized area controlled by private interests--and numerous private resort or camp areas.

The total population within a 50-mile radius is estimated at about 300,000 which includes Madison and Baraboo, the largest of the urban areas.

The watershed association, local people, and civic leaders have expressed an intense interest in the development of water-based recreation. This interest has been stimulated from experience gained in observation of the upward trend in recreational use at established parks, resorts, and camping areas. The present facilities are overtaxed and many vacationers, picnickers, fishers, swimmers, campers, etc., cannot be accommodated and have been turned away to pitch their tents or locate their camping trailers in a farmer's pasture.

PROJECTS OF OTHER AGENCIES

No other Federal, County, or State works of improvement are planned for this watershed except as proposed in this plan. Several public and private water-based recreational developments exist within a radius of 25 miles. One of these is the Devils Lake State Park which accommodates more than 1,000,000 visitors each year. Another highly commercialized recreational complex, mostly private, is the Dells. The proposed works of improvement will supplement such existing recreational facilities.

BASIS FOR PROJECT FORMULATION

Project objectives listed in the watershed application are as follows:

1. Intensify efforts to control erosion and promote good land use on all farms in the watershed and do this as rapidly as possible.
2. Obtain substantial reduction in floodwater and silt damage as well as reduce the frequency floods occur.
3. To lower road and bridge maintenance as well as new construction cost, thereby providing economic benefits to the whole community and county as well.
4. To reduce or eliminate the threat of floods to business and recreational establishments in Plain.
5. To implement on-farm drainage.
6. Reduce sediment and debris damage.

7. Through stabilization of the stream and improvement of the water supply, it is anticipated that both the wildlife and fish habitat will be improved resulting in increased recreational values.
8. To improve the recreational aspects through community support that will develop new facilities and improve existing facilities.

These objectives have been discussed with technical planning personnel. The degree of flood protection and water management agreed upon by the sponsoring organization, the Soil Conservation Service, the State Soil and Water Conservation Committee, and the Wisconsin Conservation Department is as follows:

1. Five-year flood-free protection on 70 percent of all flood plain areas within the evaluation reaches.
2. One-hundred-year protection to private and public buildings in the village of Plain.
3. Reduction of road and bridge damage comparable to that provided to agricultural areas.
4. Provide one recreational development for the enjoyment of local and surrounding area residents, and vacationers.

The flood plain in the entire watershed is about 6,000 acres. Of this amount only 2,596 acres have been considered for evaluation of damages and benefits. The flood plain from a line about two miles below Plain to the mouth of Honey Creek is broad and flat. All of this area is either permanent pasture or idle land with a high water table. It was mutually agreed that this downstream area would not warrant the installation of structural measures and that the area should continue in its present use.

A program of land treatment measures for watershed protection would reduce erosion and conserve the soils on the upland areas. It would also provide a small measure of flood protection to flood plain areas.

Eleven floodwater retarding sites for flood prevention were investigated. Of these, a combination of four sites was selected as the most economical group. Several of the proposed sites lacked adequate storage, while others had roads, bridges and farmsteads in the pool area. Increased costs for changes in cultural features would be greater than anticipated benefits.

Since floodwater retarding structures will not provide an adequate degree of protection, channel improvement is proposed in the reaches of B, C, E, and H₂. A dike is needed in reach C₁ to further alleviate damages in the village of Plain.

Location of structural measures and evaluation reaches are shown on the Project Map.

One of the objectives of the local sponsoring organization was to locate and develop a multipurpose structure to include public recreation as an added purpose. With technical assistance from a three-man technical committee, representing the State Soil and Water Conservation Committee, Soil Conservation Service, and Wisconsin Conservation Department, Site 3 was investigated and found to be the most suitable lake and park location. Guidelines and technical assistance for planning the recreational development were furnished by the three-man technical committee and the Park Planning Division of the Wisconsin Conservation Department. It is estimated that park use would be most intensive from Memorial Day through Labor Day with up to 905 visitors per day. Total estimated visitor-use days for one season is 50,680.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures will be installed by individual farm operators or owners for the purpose of soil and water conservation, particularly in the upland areas. The installation of land treatment measures has been the first increment considered for watershed protection.

An accelerated program of land treatment measures will include provision for adequate protection of structure site areas. It has been estimated on the basis of information provided by the work unit conservationist that 13,780 acres now are adequately protected and that adequate protection will be provided on an additional 5,312 acres during the five-year project installation period.

The land treatment measures to be installed on cropland areas consist of conservation cropping systems, contour stripcropping, grass waterways, diversions, terraces, surface drainage ditches, grade stabilization structures, and farm ponds. Alternate combinations which will achieve essential treatment can be a substitution of diversions for stripcropping. The land treatment measures on pasture areas consist of pasture renovation, structures for grade stabilization, and farm ponds for livestock water and flood detention. The land treatment measures for wildlife areas are stream-bank fencing and wildlife ponds. Measures to be installed on forest land consist of tree planting, livestock exclusion, and forest management cultural practices.

Costs of planning and applying land treatment measures are shown in Table 1.

Structural Measures

Structural measures proposed within the framework of this work plan are for the purpose of watershed protection and recreation. They will serve as supplements to the land treatment program to reduce floodwater damage and permit fuller development of soil and water resources.

Three single purpose floodwater retarding structures and one multiple purpose floodwater retarding and recreation structure will control the runoff from 18.89 square miles, which is 26.6 percent of the total watershed.

Structure No. 3 is designed as a multiple purpose floodwater retarding and recreation structure. It is designed with a sediment pool and recreation lake of 104 surface acres. It will be provided with a device to draw cold water from the lower levels of the recreation lake and discharge it downstream to sustain water quality. Another device will be installed to allow dewatering the pool for fisheries management. The cold water withdrawal and dewatering devices are items associated only with the purpose of recreation.

The lake will be roughly rectangular in shape with one recreational area located immediately below the structure. This area will provide a large day-use picnic area which will accommodate approximately 500 people, parking facilities for 130 automobiles, a shelter house, and a public access road into the area. The blacktopped road, leading from an existing town road, will be 24 feet wide. The total proposed area within the recreational development is 1,093 acres.

On the right bank immediately upstream from the structure will be the swimming beach and changing stalls.

At the north end of the lake will be a boat launching area, picnic area, camping area, and a shelter house. Proposed basic recreational facilities, number, and estimated cost are tabulated on Table 2B.

All remaining structures are designed as single purpose floodwater retarding structures. They will be designed as "dry dams". The location of all structures is shown on the Project Map.

The total detention capacity for floodwater is 1,627 acre-feet being equivalent to 1.62 inches of runoff from a controlled area of 18.89 square miles. Other storage capacity provided in the structures is 503 acre-feet for sediment accumulation during a 100-year period and 1,070 acre-feet for a recreation lake.

Three and seventy-five hundredths miles of channel improvement and 0.27 mile of flood plain dike is planned. The dike and channel improvement will provide 100-year frequency flood protection to the village of Plain. The channel improvement is designed to provide between three and five-year frequency flood protection to the agricultural farm land.

The total estimated installation cost for the single purpose floodwater retarding structures is \$356,929, of which \$318,376 is P.L. 566 cost and \$38,553 is other cost.

The total estimated cost of installing the multiple purpose floodwater retarding and recreation structure is \$529,976, of which \$280,766 is P.L. 566 cost and \$249,210 is other cost.

The total estimated cost of channel improvement (including dike) is \$99,426, of which \$93,825 is P.L. 566 cost and \$5,601 is other cost.

Details on quantities, costs, and design features are found in Tables 1, 2, and 3.

EXPLANATION OF INSTALLATION COSTS

Land treatment measures will be installed on agricultural land by individual farm operators and owners as cooperators with the Sauk County Soil and Water Conservation District. The entire installation costs, except technical services for planning and application, will be from other than P.L. 566 funds. Technical services will be furnished by the Soil Conservation Service and Forest Service of the U. S. Department of Agriculture, Wisconsin Conservation Department, Agricultural Extension Service, and the Fish and Wildlife Service of the U. S. Department of the Interior.

Funds for technical services will be provided as follows: planning and application of land treatment measures - P.L. 566, \$10,183; planning and application of woodland measures - P.L. 566, \$2,845; and the Wisconsin Conservation Department, Forest Management Division - \$2,725. An accelerated program of installation of land treatment measures will be accomplished during the project period.

Cost sharing payments are made by the Agricultural Conservation Program of the Agricultural Stabilization and Conservation Service to individual farms to defray their costs for installation of most land treatment measures. The total estimated land treatment installation cost is \$81,272, of which \$68,244 will be borne by other funds and the remaining amount of \$13,028 will be borne by P.L. 566 funds for accelerated land treatment measures. The cost of installing forestry measures, exclusive of technical assistance, is estimated to be \$9,465. Estimated planning and installation costs for land treatment measures are shown in Table 1.

The structural measures are planned for flood prevention and recreational purposes. Elements of installation costs for the indicated purposes are construction, which includes contingency allowances; engineering services, including foundation and borrow investigations; other installation services; administration of contracts; land, easements, and rights-of-way; and water rights.

The entire construction, engineering and installation services costs will be furnished by the Soil Conservation Service for flood prevention purposes. Costs for land, easements, and rights-of-way; water rights; administration of contracts; and road changes or additions will be provided by the sponsoring local organization. Costs for road and bridge improvements and public utility changes also will be provided by the sponsoring local organization.

The total estimated flood prevention project cost for structural measures is \$552,179, of which \$507,376 will be borne by P.L. 566 and the remaining amount of \$44,803 will be borne by other funds.

Joint project construction cost for multiple purpose structure 3 was allocated to flood prevention and recreation by the use-of-facilities method. The joint cost totaling \$179,047 was allocated at 41.7 percent for flood prevention and 58.3 percent for recreation. The specific construction cost for recreation totals \$12,190.

Project installation cost for recreation at site No. 3 will be cost-shared as follows:

P.L. 566 funds

1. Not more than 50 percent of the construction cost for the dam allocated to recreation.
2. One hundred percent of the construction cost for the dam allocated to flood prevention.
3. Eleven and three-tenths percent of the land cost for 1,093 acres which is equivalent to 50 percent of the cost for an area of 247 acres.
4. Fifty percent of construction cost for basic recreational facilities.
5. One hundred percent of the cost for engineering and installation services for the structure.
6. The Soil Conservation Service may pay up to 50 percent of payments for consulting architectural and engineering services and other installation services associated with the basic recreational facilities.
7. The Soil Conservation Service may assist, as available, with on-site locations, design, and supervision of basic recreational facilities.

Other funds

1. At least 50 percent of the construction cost for the dam allocated to recreation.
2. Eighty-eight and seven-tenths percent of land purchase cost for 1,093 acres.
3. Fifty percent of construction cost for recreational facilities.
4. Fifty percent of payments for consulting architectural and engineering services and other installation services associated with the basic recreational facilities.

5. One hundred percent of engineering, legal and administrative cost for acquisition of all land, easements and rights-of-way.
6. One hundred percent of all administration of contract cost.

The estimated project installation cost for a recreational development at structure site 3 is \$529,976, of which \$280,766 will be borne by P.L. 566 funds and \$249,210 will be borne by other funds.

The estimated P.L. 566 and other obligations to be expended each year during the project period are as follows:

| <u>Year</u> | <u>P.L. 566</u> | <u>Other</u> | <u>Total</u> |
|-------------|-----------------|--------------|--------------|
| 1st | \$357,651 | \$170,903 | \$528,554 |
| 2d | 82,063 | 83,924 | 165,987 |
| 3d | 159,428 | 32,936 | 192,364 |
| 4th | 93,825 | 5,601 | 99,426 |
| 5th | -- | -- | -- |

The sponsoring organization will be responsible for the following:

1. Acquire all land, easements, and rights-of-way.
2. Acquire all necessary water rights.
3. Furnish a contracting officer and administer the contracts for construction.
4. The cost of operation and maintenance.
5. Obtain cooperative agreements with individual farm owners and operators for planning and installation of land treatment measures.
6. Pay for all engineering, legal and administrative costs for acquisition of land, easements, and rights-of-way.

EFFECTS OF WORKS OF IMPROVEMENT

Land treatment measures will reduce soil erosion and improve the hydrologic characteristics of the upland watershed areas. Conservation benefits will include increased farm income and the preservation and improvement of agricultural lands.

All or parts of 135 farm units have land in the flood plain. These farm units will receive flood prevention benefits from the installation of protective measures. An area of 5,312 acres or about 11.8 percent of the total watershed will have land treatment measures installed during the project period and these acres will then be adequately treated.

Agricultural land inundated by a major flood event is 2,596 acres within the evaluation boundaries of the watershed. It is further estimated that an additional 3,477 acres of agricultural land are inundated and subject to minor flood damage within an area extending downstream from the evaluated area to the confluence of the North Branch Honey Creek near the village of Witwen. Therefore, about 2,596 acres will be the minimum area benefited by this program of flood prevention measures. About 30 percent, or 779 acres, will be entirely flood-free for a 100-year frequency flood event following installation of the structural measures.

Studies show that 871 acres do not flood on a five-year flood event. Upon completion of works of improvement, an additional area of 898 acres will have five-year frequency flood protection.

Channel erosion rates will be reduced since the floodwaters will be temporarily impounded in the retarding reservoirs and permitted to move downstream with decreased eroding powers. At least 90 percent of the sediment derived from upland sheet and streambank erosion will be trapped and stored behind structures in volumes allocated for this specific purpose.

The channel improvement is planned to alleviate floodwater damages in Plain and give flood-free protection to the agricultural area. With the structures and the channel improvement, restoration of former productivity can be realized in the lower reaches.

Plain will have complete floodwater protection for all flood events which have a probability of occurring equal to one each 100 years.

Multipurpose structure 3 will provide extensive recreational facilities. The 104-acre permanent lake, recreational facilities, and additional land area will be used for swimming, fishing, limited boating, hiking, picnicking, and camping.

This recreational development is planned for use during a three-month period during the summer months from approximately June 1 thru September 1. It is estimated that 905 people will use this recreation facility per day during the summer. During the weekdays only 50 percent of the 905 people and on weekends 100 percent are expected to make use of this development. During the summer season it is anticipated that 50,680 visitor days will be realized at this recreation development.

PROJECT BENEFITS

Monetary benefits used for project justification consist of (1) direct and indirect primary benefits and (2) local secondary benefits. Primary benefits are those realized from the reduction of agricultural and non-agricultural floodwater damages in the flood plain, those which accrue from the conversion of pasture and idle land to cropland, and recreational use.

Local secondary benefits are realized within the immediate zone of influence of the project. They include benefits from (1) the transporting, processing and marketing of those goods and services that produce the primary benefits and (2) the supplying of additional materials and services required to make possible the increased net returns which stem from installation of the project. Secondary benefits were computed from a local standpoint only, as secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation of the watershed.

Total benefits from the project are estimated to be \$100,303. Of this amount \$97,935 are primary benefits and \$2,368 are secondary benefits. Primary benefits consist of the following: damage reduction, \$20,160; changed land use, \$1,755; and recreation, \$76,020. In addition, land treatment measures will provide \$620 in damage reduction benefits annually.

Average annual recreation benefits from multipurpose structure 3 are estimated at \$76,020 and are computed on the basis of 50,680 visitor days per year at \$1.50 per visitor day. The amount of \$1.50 per visitor day is the rate normally used for a fully developed recreational facility such as structure site 3.

COMPARISON OF BENEFITS AND COSTS

The ratio of the average annual primary benefits (\$97,935) to the estimated average annual costs (\$49,396) is 2.0 to 1.0. This is exclusive of secondary benefits. Total average annual benefits, including secondary benefits, are \$100,303. The benefit-cost ratio is 2.0 to 1.0. Table 6 shows a comparison of annual costs to annual benefits.

PROJECT INSTALLATION

Land treatment measures will be installed by individual farm owners or operators in cooperation with the Sauk County Soil and Water Conservation District. Technical assistance for farm planning and installation of land treatment measures will be furnished by the U. S. Soil Conservation Service, Wisconsin Conservation Department in cooperation with the U. S. Forest Service, Agricultural Extension Service, and the Fish and Wildlife Service of the U. S. Department of the Interior. Technical assistance for forestry measures will be provided under the accelerated program by the Wisconsin Conservation Department and financed by State funds and matching P.L. 566 funds. Cost-sharing for construction and installation of land treatment measures will be provided by the Agricultural Conservation Program of the Agricultural Stabilization and Conservation Service.

Installation of structural measures will follow a sequence such that upstream works of improvement will precede the installation of those that lie downstream. In this manner downstream channels can be designed and installed at the least cost for the flood prevention purpose. Project costs and evaluations of measures have proceeded on that basis in this work plan.

Preparation of all plans and specifications for single purpose flood prevention works of improvement and multiple structure No. 3 will be accomplished by the Soil Conservation Service. The Wisconsin Conservation Department will be consulted on design features related to fisheries management. Design criteria and provisions required for proper operation and management of water resources, and water as related to fisheries, will be furnished to the Soil Conservation Service by the Wisconsin Conservation Department.

The Sauk County Park Committee will provide plans and specifications for recreational facilities. The Wisconsin Conservation Department will furnish engineering services for design and layout for access road to navigable water, boat ramp, and car-trailer parking. Planning service for recreational development may be available from the Wisconsin Conservation Department in accordance with Section 27 of the State Statutes. Detailed recreational planning services require the solicitation of a private engineering firm. Plans and specifications for recreational facilities will be submitted to the Soil Conservation Service for approval.

Construction of structural works of improvement for single purpose flood prevention and structure No. 3 will be accomplished by private contract. The installation of recreational facilities may be accomplished by private contract or force account. All contracts will be awarded on the basis of competitive bid by qualified bidders. Contracts will be administered by the sponsoring organization.

Project agreements will be executed for each contract unit of work by the sponsors and the Soil Conservation Service. Prior to the execution of such agreement, all land, easements, and rights-of-way will be obtained and properly recorded by the sponsoring organization in their county. The power of eminent domain for purposes of flood prevention and recreation is vested in county soil and water conservation districts under Section 92.08(3), Wisconsin Statutes. The district has agreed to exercise their power of eminent domain, where applicable, to obtain easements.

The Soil Conservation Service will provide all technical assistance for layout and inspection for the installation of structural works of improvement, except basic recreational facilities. Assistance for layout, design, and supervision of basic recreational facilities will be provided by the Soil Conservation Service when available. The Service will inspect all basic recreational facilities to determine that they are installed in accordance with engineering plans and specifications.

The Sauk County Soil and Water Conservation District will obtain cooperative agreements with individual farmers to install land treatment measures during the project period.

A schedule for installation of the structural works of improvement is established for a five-year project period. The construction schedule is as follows:

| <u>Year</u> | <u>Works of Improvement</u> |
|-------------|--|
| 1st | Multiple purpose structure 3 and floodwater retarding structure 4 |
| 2d | Recreational facilities at Site 3 |
| 3d | Floodwater retarding structures 1 and 2 |
| 4th | Channel - reaches B, C, E, H ₂ , and dike in reach C ₁ |
| 5th | -- |

FINANCING PROJECT INSTALLATION

Federal financial assistance for the installation of works of improvement, as given in this watershed work plan, will be provided under authority of the Watershed Protection and Flood Prevention Act (Public Law 566), as amended. Federal funds to be furnished by the U. S. Soil Conservation Service are contingent upon appropriations available for this purpose. The estimated amount to be furnished by P.L. 566 funds for project installations is \$705,995, of which \$13,028 is for technical assistance for the installation of land treatment measures and \$692,967 for the installation of structural works of improvement.

The estimated total project cost for the installation of land treatment measures is \$81,272, of which \$13,028 are P.L. 566 funds for technical assistance and \$68,244 are other funds.

The estimated total project cost for the installation of land treatment forestry measures is \$15,035, of which \$2,845 are P.L. 566 funds for technical assistance, \$9,465 for installation of woodland measures, and \$2,725 other funds for technical assistance.

The cost of installing the forestry measures, exclusive of technical assistance is estimated to be \$9,465. The landowners and operators will bear this cost. It is expected that the Agricultural Conservation Program cost-sharing will be available to qualified landowners for installing these measures. The Wisconsin Conservation Department, Forest Management Division, will provide \$2,725 for technical assistance for installing forestry measures.

P.L. 566 funds for technical assistance are for farm planning and other technical services required for the acceleration of the installation of land treatment measures in addition to that carried out in the normal going program.

The structural works of improvement proposed in the work plan are for flood prevention and recreational purposes. Total estimated project cost for structural measures is \$986,331, of which \$692,967 will be borne by P.L. 566 funds and \$293,364 will be borne by other funds.

The total estimated installation cost for the three single purpose floodwater retarding structures, 3.75 miles of channel improvement and 0.27 mile of dike is \$456,355, of which \$412,201 is P.L. 566 cost and \$44,154 is other cost. By resolution the Sauk County Board has agreed to furnish \$44,154 to defray all other cost for single purpose floodwater retarding structures, channel improvement and floodwater dike. Other funds are for administration of contracts, land, easements, and rights-of-way, and road and utility changes. These other costs are shown in Tables 1 and 2.

The estimated project installation cost for multiple purpose structure 3 (flood prevention and recreation) is \$529,976, of which \$280,766 is P.L. 566 cost and \$249,210 is other cost. Total estimated project installation cost for flood prevention is \$95,824. Of this amount \$95,175 is P.L. 566 cost and \$649 is other cost. Other cost is for administration of contracts and is the responsibility of the sponsoring local organization. Total estimated project installation cost for recreational purposes for multiple purpose structure 3 is \$434,152. Of this amount, \$185,591 will be P.L. 566 cost and \$248,561 will be other cost.

P.L. 566 funds for recreational purposes are as follows:

| | |
|---|------------------|
| Construction | \$ 58,287 |
| Engineering | 22,904 |
| Other Services | 9,123 |
| Land, Easements and Rights-of-Way | 13,214 |
| Recreational Facilities | |
| Construction | 76,963 |
| Engineering and installation services | 5,100 |
| Total | <u>\$185,591</u> |

Other project funds for recreational purposes are as follows:

| | |
|---|------------------|
| Construction | \$ 58,287 |
| Administration of Contracts | 2,014 |
| Land, Easements and Rights-of-Way | 105,337 |
| Recreational Facilities | |
| Construction | 76,963 |
| Engineering and installation services | 5,960 |
| Total | <u>\$248,561</u> |

The Sauk County Soil and Water Conservation District will be financially responsible for all other costs for installing and maintaining the structural works of improvement.

By commitment, local project installation cost will be furnished as follows:

1. Sauk County Board and other local civic and governmental units - \$176,543. This exceeds the amount required for their estimated financial obligation. The Sauk County Board will be the repository for these funds.
2. State Soil and Water Conservation Committee - \$118,000, to the extent funds are available for this purpose, for local structure installation cost allocated to recreation and land acquisition at structure site No. 3. The estimated cost sharing is: \$43,715 for structure construction and \$74,285 for land acquisition.
3. Wisconsin Conservation Department - an estimated \$6,160 for the installation of the access road, boat ramp, and car-trailer parking. This estimated amount includes \$5,800 for construction and \$360 for engineering services.

Other funds furnished by other organizations will be made available to the district as needed.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by landowners and farm operators. This will be accomplished under a district-cooperator agreement with the soil and water conservation district.

Forestry measures will be maintained by landowners and operators with technical assistance provided by the Wisconsin Conservation Department, Forest Management Division, in cooperation with the U. S. Forest Service under the going Cooperative Forest Management Program.

Technical assistance for maintenance will be provided to the district by the Soil Conservation Service technicians assigned to the district and by Wisconsin Conservation Department technicians working in Sauk County.

The Sauk County Soil and Water Conservation District has obtained a commitment from the Sauk County Board that the Board will furnish funds for maintenance and operation of all structures installed under this plan. This commitment is in the form of a resolution passed by the Sauk County Board on August 23, 1960. The plan for operation and maintenance will be as follows:

1. Each year, and after every severe storm, an inspection of structures will be made by the Chairman of the Soil and Water Conservation District Supervisors, President of the Plain-Honey Creek Watershed Association, Chairman of the Highway Committee of the County Board, and a representative of the Soil Conservation Service. They will decide what maintenance is needed.
2. The inspection will cover all portions of the structure, channel below, ponded area above, the channel improvement and dike area.

3. Water, fish and forest management will be accomplished by the sponsoring organization with technical assistance furnished by the Wisconsin Conservation Department for the maximum public use of all facilities.
4. The sponsoring organization will provide custodial, policing, sanitation, safety and other operational services for the recreational development.
5. A specific agreement for maintenance will be prepared for each construction unit before advertisement for bids will be made.

The estimated operation and maintenance for the flood prevention structural measures is \$2,972 and for recreational development, \$14,112.

The operation and maintenance cost for the recreational development consists of the following:

| | |
|---|----------|
| Average annual maintenance of recreational facilities | \$ 4,104 |
| Average annual replacement cost of recreational facilities | 6,008 |
| Average annual operation cost of recreational facilities | |
| Custodian (per season) | 1,200 |
| Equipment (per season) | 1,000 |
| Lifeguard (per season) | 1,800 |
| | <hr/> |
| Total operation and maintenance cost of recreational facilities | \$14,112 |

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Plain-Honey Creek Watershed, Wisconsin

| Installation Cost Item | To be Treated | | Estimated Cost (Dollars) ^{1/} | | |
|----------------------------------|---------------|-------|--|---------|-----------|
| | Unit | No. | PL 566 | Other | TOTAL |
| <u>LAND TREATMENT</u> | | | | | |
| Soil Conservation Service | | | | | |
| Cropland | Acre | 2,000 | | 17,380 | 17,380 |
| Grassland | Acre | 1,300 | | 26,689 | 26,689 |
| Technical Assistance | | | 10,183 | 11,985 | 22,168 |
| SCS Subtotal | | | 10,183 | 56,054 | 66,237 |
| Forest Service | | | | | |
| Woodland | Acre | 2,012 | | 9,465 | 9,465 |
| Technical Assistance | | | 2,845 | 2,725 | 5,570 |
| FS Subtotal | | | 2,845 | 12,190 | 15,035 |
| TOTAL LAND TREATMENT | | | 13,028 | 68,244 | 81,272 |
| <u>STRUCTURAL MEASURES</u> | | | | | |
| Soil Conservation Service | | | | | |
| Floodwater Retarding Struc. | Each | 3 | 245,727 | | 245,727 |
| Stream Channel Improvement | Mile | 3.75 | 72,782 | | 72,782 |
| Dike | Mile | 0.27 | 4,239 | | 4,239 |
| Multipurpose Structure | Each | 1 | 132,950 | 58,287 | 191,237 |
| Recreation Facilities | | | 76,963 | 76,963 | 153,926 |
| SCS Subtotal | | | 532,661 | 135,250 | 667,911 |
| Subtotal - Construction | | | 532,661 | 135,250 | 667,911 |
| Installation Services | | | | | |
| Soil Conservation Service | | | | | |
| Engineering Service | | | 106,594 | 5,960 | 112,554 |
| Other | | | 40,498 | | 40,498 |
| SCS Subtotal | | | 147,092 | 5,960 | 153,052 |
| Subtotal - Installation Services | | | 147,092 | 5,960 | 153,052 |
| Other Costs | | | | | |
| Land, Easements & Rights-of-Way | | | 13,214 | 146,653 | 159,867 |
| Administration of Contracts | | | | 5,501 | 5,501 |
| Subtotal - Other | | | 13,214 | 152,154 | 165,368 |
| TOTAL STRUCTURAL MEASURES | | | 692,967 | 293,364 | 986,331 |
| TOTAL PROJECT | | | 705,995 | 361,608 | 1,067,603 |
| <u>SUMMARY</u> | | | | | |
| Subtotal SCS | | | 703,150 | 349,418 | 1,052,568 |
| Subtotal FS | | | 2,845 | 12,190 | 15,035 |
| TOTAL PROJECT | | | 705,995 | 361,608 | 1,067,703 |

^{1/} Price base - 1963

June 1965

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(as of July 1, 1963)

Plain-Honey Creek Watershed, Wisconsin

| Code | Measure | Unit | Applied to date | Total Cost |
|---------------------------|--------------------------------|------|--------------------|-----------------------|
| | | | | Dollars ^{1/} |
| <u>LAND TREATMENT</u> | | | | |
| Soil Conservation Service | | | | |
| 585 | Stripcropping, Contour | Acre | 5,330 | 19,465 |
| 328 | Conservation Cropping System | Acre | 7,500 | 7,500 |
| 362 | Diversion | Feet | 32,775 | 3,310 |
| 412 | Grassed Waterway | Acre | 26 | 2,600 |
| 600 | Terrace, Gradient | Feet | 20,325 | 709 |
| 590 | Drainage Field Ditch | Feet | 4,165 | 250 |
| 480 | Drainage Main or Lateral | Feet | 30,515 | 12,145 |
| 511 | Pasture and Hayland Renovation | Acre | 1,300 | 52,000 |
| 410 | Grade Stabilization Structure | No. | 4 | 8,160 |
| 402 | Floodwater Retarding Structure | No. | 9 | 22,500 |
| Forest Service | | | | |
| | Livestock Exclusion | Acre | 1,800 | 10,800 |
| | Sustained Yield Management | Acre | 150 | 150 |
| | Timber Stand Improvement | Acre | 50 | 800 |
| | Tree Planting (Reinforcement) | Acre | 20 | 900 |
| | Tree Planting (Open Field) | Acre | 60 | 2,100 |
| TOTAL | | xxx | xxx | 143,389 |

^{1/} Price base - 1963

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TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Plain-Honey Creek Watershed, Wisconsin

(Dollars)^{1/}

| Item | Purpose | | Total |
|--|------------------|------------|---------|
| | Flood Prevention | Recreation | |
| <u>COST ALLOCATION</u> | | | |
| Single Purpose | | | |
| Floodwater Retarding Structures (3) | 356,929 | | 356,929 |
| Channel Improvement and Dike | 99,426 | | 99,426 |
| Multiple Purpose | | | |
| Multiple Floodwater Retarding and Recreation Structure | 95,824 | 434,152 | 529,976 |
| TOTAL | 552,179 | 434,152 | 986,331 |
| <u>COST SHARING</u> | | | |
| P.L. 566 | 507,376 | 185,591 | 692,967 |
| Other | 44,803 | 248,561 | 293,364 |
| TOTAL | 552,179 | 434,152 | 986,331 |

^{1/} Price base - 1963

June 1965

TABLE 2B - ESTIMATED COSTS OF RECREATION FACILITIES

FOR MULTIPLE PURPOSE STRUCTURE NO. 3

Plain-Honey Creek Watershed, Wisconsin

(Dollars)^{1/}

| Item | Unit | No. | Unit Cost | Total Cost |
|---------------------------------------|------------|------------|--------------|----------------|
| | | | (Dollars) | |
| Access Road | Feet | 3,600 | 1 | 3,600 |
| Stream Fords | Feet | 80 | 50 | 4,000 |
| Internal Roads - 2-way | Feet | 4,100 | 3 | 12,300 |
| Internal Roads - 2-way | Feet | 5,300 | 2 | 10,600 |
| Internal Roads - 1-way | Feet | 3,300 | 1 | 3,300 |
| Picnic Tables | Each | 250 | 35 | 8,750 |
| Grills | Each | 155 | 25 | 3,875 |
| Wells (drilled & cased) | Each | 4 | 1,000 | 4,000 |
| Water Systems | Each | 4 | 1,100 | 4,400 |
| Toilet Sets (small) | Each | 6 | 2,200 | 13,200 |
| Toilet Sets (large) | Each | 2 | 4,500 | 9,000 |
| Picnic Area | Acre | 45 | 200 | 9,000 |
| Car Parking | Each | 190 | 100 | 19,000 |
| Car-Trailer Parking | Each | 10 | 120 | 1,200 |
| Directional Signs | Each | 12 | 30 | 360 |
| Shelter House | Each | 3 | 4,500 | 13,500 |
| Foot Bridge (3) | Feet | 30 | 150 | 4,500 |
| Swimming Beach | Feet | 200 | 10 | 2,000 |
| Changing Booth | Stalls | 10 | 100 | 1,000 |
| Boat Launch Ramp | Each | 1 | 1,000 | 1,000 |
| Fences | Rod | 1,830 | 2.70 | 4,941 |
| Submersible Pump and Pressure Tank | Each | 4 | 1,500 | 6,000 |
| Camp Units | Each | 60 | 240 | 14,400 |
| Engr. & Instal. Services | | | | 11,060 |
| Admin. of Contracts | | | | 1,000 |
| TOTAL | xxx | xxx | xxx | 165,986 |

^{1/} Price base - 1963

June 1965

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
 Plain-Honey Creek Watershed, Wisconsin

| Item | Unit | Structures | | | | Total |
|--|----------|------------------|------------------|-----------------|------------------|---------|
| | | 1 | 2 | 3 ^{1/} | 4 | |
| Drainage Area | Sq.Mi. | 3.35 | 4.00 | 6.99 | 4.55 | 18.89 |
| Storage Capacity | | | | | | |
| Sediment | Ac.Ft. | 111 | 124 | 150 | 118 | 503 |
| Floodwater | Ac.Ft. | 296 | 337 | 615 | 379 | 1,627 |
| Recreation | Ac.Ft. | xxx | xxx | 1,070 | xxx | 1,070 |
| Total | Ac.Ft. | 407 | 461 | 1,835 | 497 | 3,200 |
| Surface Area | | | | | | |
| Sediment Pool | Acre | 23.0 | 21.6 | 32.0 | 20.0 | 96.6 |
| Floodwater Pool | Acre | 48.8 | 40.8 | 128.0 | 44.5 | 262.1 |
| Recreation Pool | Acre | xxx | xxx | 104.0 | xxx | 104.0 |
| Perimetrical Strip (100 ft. wide) | Acre | xxx | xxx | 25 | xxx | |
| Volume of Fill | Cu.Yd. | 38,200 | 79,700 | 169,000 | 120,000 | 406,900 |
| Elevation-Top of Dam | Feet | 853.7 | 898.5 | 925.5 | 914.5 | |
| Maximum Height of Dam | Feet | 28 | 31 | 45 | 33 | |
| Emergency Spillway | | | | | | |
| Crest Elevation | Feet | 849.7 | 893.5 | 918.5 | 909.5 | |
| Bottom Width | Feet | 156 | 125 | 130 | 144 | |
| Type | | Veg. | Veg. | Veg. | Veg. | |
| Chance of Use | Perc. | 1 | 1 | 1 | 1 | |
| Ave. Curve No.-Cond. II | | 72 | 72 | 72 | 72 | |
| Emergency Spillway Hydro. | | | | | | |
| Storm Rainfall (6-hr.) | Inch | 5.55 | 5.55 | 6.75 | 5.55 | |
| Storm Runoff | Inch | 2.63 | 2.63 | 3.62 | 2.63 | |
| Velocity of Flow (V _c) ^{2/} | Ft./Sec. | 4.9 | 5.7 | 7.2 | 5.9 | |
| Discharge Rate ^{2/} | c.f.s. | 593 | 695 | 1,410 | 898 | |
| Max. w.s. Elevation ^{2/} | Feet | 851.1 | 895.4 | 921.3 | 911.5 | |
| Freeboard Hydrograph | | | | | | |
| Storm Rainfall (6-hr.) | Inch | 9.53 | 9.53 | 12.30 | 9.53 | |
| Storm Runoff | Inch | 6.06 | 6.06 | 8.62 | 6.06 | |
| Discharge Rate ^{2/} | c.f.s. | 2,920 | 3,480 | 5,950 | 3,950 | |
| Max. w.s. Elevation ^{2/} | Feet | 853.7 | 898.5 | 925.5 | 914.5 | |
| Principal Spillway | | | | | | |
| Storm Rainfall | Inch | 3.75 | 3.75 | 3.97 | 3.75 | |
| Storm Runoff (AMC II $\frac{1}{2}$) | Inch | 1.84 | 1.84 | 2.02 | 1.84 | |
| Size of Conduit (Dia.) | Inch | 30 | 36 | 42 | 36 | |
| Design Storm Duration | Hour | 6 | 6 | 6 | 6 | |
| Capacity | c.f.s. | 97 | 161 | 279 | 169 | |
| Ave. Curve No.-Cond. II $\frac{1}{2}$ | | 80 | 80 | 80 | 80 | |
| Capacity Equivalents | | | | | | |
| Sediment Volume | Inch | 0.62 | 0.58 | 0.40 | 0.49 | |
| Detention Volume | Inch | 1.66 | 1.58 | 1.66 | 1.56 | |
| Spillway Storage | Inch | 1.02 | 1.12 | 2.73 | 1.00 | |
| Class of Structure | | a+ ^{3/} | a+ ^{3/} | b | a+ ^{3/} | |

1/ Multiple Purpose Structure; 2/ Maximum during passage of hydrograph;
 3/ Principal, Emergency and Freeboard Rainfall, $\frac{a+b}{2}$ Criteria

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TABLE 3A - STRUCTURE DATA

CHANNELS

Plain-Honey Creek Watershed, Wisconsin

| Channel Design- nation | Sta. Numbering for Reach | | Water- shed Area (Sq.Mi.) | Planned Channel Capacity (cfs) | Average Bottom Width (ft.) | Average Side Slope | Average Depth (ft.) | Average Grade (Pct.) | Average Velocity in Channel (ft./sec.) | Volume of Excavation (1000 cu.yd.) |
|------------------------------|-----------------------------|------|------------------------------------|---|-------------------------------------|--------------------------|---------------------------|----------------------------|---|---|
| | Sta. | Sta. | | | | | | | | |
| B | 100 | 180 | 24.4 | 1,850 | 24 | 2:1 | 8.7 | 0.10 | 5.1 | 89.5 |
| C | 300 | 320 | 3.3 | 500 | 24 | 2:1 | 4.4 | 0.16 | 3.4 | 9.3 |
| E | 180 | 228 | 16.3 | 950 | 24 | 2:1 | 6.0 | 0.13 | 4.4 | 22.4 |
| H ₂ | 228 | 278 | 13.2 | 650 | 24 | 2:1 | 5.0 | 0.13 | 3.0 | 35.0 |

TABLE 3B - STRUCTURE DATA

DIKE

Plain-Honey Creek Watershed, Wisconsin

| Reach | Sta. Numbering for Reach | | Top Width | Side Slope | Average Depth | Required Capacity | Estimated Fill |
|----------------|-----------------------------|-------|--------------|---------------|------------------|----------------------|-------------------|
| | Sta. | Sta. | | | | | |
| | (100 | ft.) | | | | | |
| | | (ft.) | (ft.) | | (ft.) | (cfs) | (cu.yd.) |
| C ₁ | 100 | 114 | 8 | 2½:1 | 4.0 | 1,175 | 2,750 |

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TABLE 4 - ANNUAL COST

Plain-Honey Creek Watershed, Wisconsin

(Dollars)^{1/}

| Evaluation Unit | Amortization of Installation Cost ^{2/} | Operation and Maintenance Cost | Total |
|--|---|--------------------------------|--------|
| Floodwater Retarding Structures 1, 2, & 4; Channel Improvement; Dike; and Multiple Purpose Structure 3 (including recreational facilities) | 32,312 | 17,084 | 49,396 |
| TOTAL | 32,312 | 17,084 | 49,396 |

^{1/} Price base - 1963 prices for installation costs;
1963 prices projected to long term for operation
and maintenance cost

^{2/} Interest rate - 3-1/8 percent, 100-year evaluation period

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Plain-Honey Creek Watershed, Wisconsin

(Dollars)^{1/}

| Item | Estimated Average Annual Damage | | Damage Reduction Benefit |
|--------------------|---------------------------------|--------------|-----------------------------|
| | Without Project | With Project | |
| Floodwater | | | |
| Crop and Pasture | 19,871 | 7,330 | 12,541 |
| Other Agricultural | 2,562 | 947 | 1,615 |
| Non-Agricultural | | | |
| Roads and Bridges | 4,272 | 443 | 3,829 |
| Urban | 535 | 0 | 535 |
| Subtotal | 27,240 | 8,720 | 18,520 |
| Indirect | 3,177 | 917 | 2,260 |
| TOTAL | 30,417 | 9,637 | 20,780 |

^{1/} Price base - 1963 prices projected to long term

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Plain-Honey Creek Watershed, Wisconsin

(Dollars)^{1/}

| Evaluation Unit | Damage Reduction ^{2/} | Average Annual Benefits | | | Average Annual Cost | Benefit-Cost Ratio |
|--|--------------------------------|-------------------------|-----------------------|--------------------|---------------------|--------------------|
| | | Changed Land Use | Recreational Benefits | Secondary Benefits | | |
| | | Agriculture | | | Total | |
| Floodwater Retarding Structures 1, 2, & 4; Channel Improvement; Dike; and Multiple Purpose Structure 3 (including recreational facilities) | 20,160 | 1,755 | 76,020 | 2,368 | 400,303 | 2.0 to 1.0 |
| TOTAL | 20,160 | 1,755 | 76,020 | 2,368 | 100,303 | 2.0 to 1.0 |

^{1/} Price base - 1963 prices for installation costs;

1963 prices projected to long term for benefits and operation and maintenance costs

^{2/} In addition, it is estimated that land treatment will provide flood damage reduction benefits of \$620 annually.

INVESTIGATIONS AND ANALYSES

The Soil Conservation Service, Forest Service, Wisconsin Conservation Department, Agricultural Extension Service, and the Fish and Wildlife Service of the U. S. Department of the Interior have provided technical assistance to the sponsoring local organization in the development of this work plan. Procedures and methods used in this work plan development are set forth in the National Watershed Protection, Hydrology, Hydraulic, Geology, and Economics Handbooks; and Washington, Milwaukee, and Wisconsin Memoranda.

A preliminary investigation report was prepared prior to approval for planning. This report was presented to the local sponsoring organization, and they concurred in developing a work plan for the watershed in accordance with proposed project measures.

It was also agreed that a land treatment program would be developed for the entire watershed.

Other water resource development objectives include a recreational development at structure site 3.

Hydrologic Analysis

A synthetic storm series was used for the analysis of this watershed. Rainfall frequency curves were developed from the Weather Bureau's Technical Paper No. 40 for 6-hour duration storms. Point rainfall by frequency for this watershed is as follows: 100-year frequency, 4.35 inches; 50-year, 3.97 inches; 25-year, 3.56 inches; 10-year, 3.04 inches; 5-year, 2.68 inches; and 2-year, 2.13 inches.

Rainfall runoff relationships were determined from a study of the soils and soil cover in the watershed. Tabulation of the land use by the soil types was prepared to determine the soil cover complex number. The Forest Service assisted by determining the forested soil cover complex number. Honey Creek was found to be predominately in the B hydrologic soil group with a runoff curve number of 72.

Synthetic triangular hydrographs were developed for each sub-area and floodrouted through the watershed by the Wilson method. Hydrographs were developed for the following conditions:

1. Present conditions.
2. With structures 1, 2, 3, and 4.
3. With structures 1, 2, 3, 4, and channel improvement.
4. With structures and channel improvement combinations for construction units. The channel improvement construction units were evaluated with all structures involved.

The above steps were completed to develop the inches runoff-peak discharge relationships for various frequency storms. These runoff-discharge relationships were used to study each evaluation reach for each degree of control.

Reference material used in the hydrologic analysis of this watershed is as follows:

1. National Engineering Handbook, Section 4, Hydrology, Supplement A.
2. U. S. Weather Bureau Technical Paper No. 40.
3. Wisconsin Engineering Memorandum WI-6.
4. Milwaukee E&WP Unit Hydrology Memorandum No. 4.
5. Milwaukee E&WP Unit Hydrology Memorandum No. 5.

Hydraulic Analysis

The field surveys consisted of 17 valley and stream sections, 22 road and bridge sections, and a topographic plan of Plain showing channel, buildings, roads, etc. All surveys were tied into mean sea level elevations.

There are 10 reaches selected for the evaluation of damages and benefits in the watershed. The reaches were selected to show representative areas between the junctions of tributaries and to keep the reaches sufficiently short.

In development of the water surface profiles, Manning's (n) coefficients ranged from 0.045 to 0.065 in the channel and from 0.075 to 0.100 for unimproved channel conditions in the valley flood plain. With the various Manning's (n) coefficients, water surface profiles were developed by the Step Method for the village of Plain and by Manning's formula for the agricultural area.

Stage-discharge curves were developed from the water surface profiles. Stage area flooded relationships were developed from a combination of the soils maps, surveyed sections, and aerial photographs. The flooded area computed from the surveyed sections was used where the surveyed sections were representative of the reach. In some reaches adjustment factors were used to show more realistic values of the flood plain area. Stage area flooded curves were then developed to be used in the economic analysis.

The channel outlet of the watershed project has a slope of approximately 0.001. Channel improvement was extended some distance into lower reach B to provide an adequate outlet. No induced damages will occur downstream from watershed boundary.

Design

Floodwater retarding and multipurpose structures

Engineering field surveys, referenced to mean sea level datum, were made for four floodwater retarding structures. One cross section was surveyed at the centerline of the structure and additional cross sections at about 500-foot intervals in the retarding pool. An additional cross section for structure 3, the multiple purpose structure, was surveyed about 200 feet downstream from the structure centerline. A 100-year evaluation period is used for design purposes. Sediment volumes for 100 years were based on detailed analyses of all structure sites.

The crests of the principal spillways for single purpose floodwater retarding structures have been set at the 50-year sediment volume elevation. Additional storage above this elevation has been apportioned for the remainder of the 100-year sediment volume.

Structures 1, 2, and 4 were designed as "dry dams" with drawdown tubes to drain the sediment pools. The drawdown tube in structure 4 will also be utilized to pass the base flow through the structure. Structures 1, 2, and 4 have been planned on hazard class $\frac{a+b}{2}$ (a+) criteria.

Multiple purpose structure 3 is planned for flood prevention and recreation. The permanent pool has a surface area of 104 acres with a depth of 15 feet for 35 percent of the pool area. The base flow at this site will be withdrawn near the bottom of the pool by a conduit attached to the concrete riser. Facilities will be incorporated in the riser, whereby the permanent pool may be drained, if necessary, for fish management purposes.

A yield study was made for the site 3 recreational pool. The study was based on an average yield at 80 percent chance with consideration given to rainfall, seepage, and evaporation losses. The study was made starting with a full pool at the beginning of the study period. It was found that the pool would remain full at all times without an upstream blanket, but with a core extending to about an 8-foot depth.

The floodwater retarding and multiple purpose structure preliminary designs include one-stage risers, concrete conduits, and excavated emergency spillways.

Detention volumes are based on 6-hour duration rainfall amounts with antecedent moisture condition $\frac{II + III}{2}$ for the class $\frac{a+b}{2}$ structures. The emergency and freeboard hydrographs are based on class $\frac{a+b}{2}$ criteria, with antecedent moisture condition II. The TR 10 check was made for all structures and it was found that the TR 10 requirements did not govern in any instance.

Structure design was based on procedures and criteria set forth in Engineering Memorandum SCS-27, Engineering Memorandum WI-6 and Sections 3.10 and 3.21 of the Hydrology Guide.

Channel Improvement

The hydrologic valley cross sections were used in the design of the channel improvement. The present bottom slope was determined from field surveys.

The channel improvement was designed to follow the alinement of the present channel with minor straightening.

The channel improvement is designed for flood prevention only. The channel is designed using Washington Technical Release No. 15 and hydraulics tables. The design is also based on procedures set forth in Watershed Memorandum SCS-51.

The coefficient of roughness "n" for the improved channel is estimated at 0.030. The channel is designed with 2:1 side slopes.

The channel has a bottom width of 24 feet and a depth varying from 4 to 8 feet. The channel should be provided with a small "v" bottom to discharge the daily flow. The channel has a design velocity varying from 3.0 to 5.1 feet per second.

The channel improvement in reaches B, C, E, and H₂ is designed to give approximately three-year frequency flood protection to the entire agricultural area. A dike is also planned along the east side of Plain to give 100-year frequency flood protection to the village.

It is anticipated that all costs incurred from the disposal of spoil will be project costs. Where possible, the spoil will be placed in the old channel. The remaining spoil will be spread within the right-of-way and seeded. The channel banks will be seeded also.

The channel design is based on a 50-year evaluation period.

Costs

Costs of the structural measures were computed on the basis of unit prices compiled from contracts of P.L. 566 watersheds in the state.

Geology

A reconnaissance geologic survey of Plain-Honey Creek was made to determine the stratigraphic sequence of Cambrian and Ordovician formations, their lithology, and the general geologic structure of the area.

Cambrian and Ordovician rocks outcrop in the watershed but are considerably obscured by recent soils, alluvium, and Pleistocene loess and alluvial deposits.

The area, in late youth or early maturity, is characterized by relatively narrow finger-like ridges, gently rolling uplands, and steep valley slopes. Drainage pattern in the upstream one-half of the watershed is dendritic, but the lower half of the watershed has a very thick fill of Pleistocene alluvium and an underfit meandering stream with much swamp land.

The oldest rock exposed in the watershed is the Galesville formation of Cambrian age. The Galesville is a conspicuous gray-white massive cliff forming fine to medium sandstone about 60 feet thick. The Galesville lacks glauconite and is non-fossiliferous.

Above the Galesville is the Franconia formation of Cambrian age. The contact of the two formations is quite even and the Galesville scarp is succeeded by a steep slope of greensand, sandstone sedges, and much loose sand and sandstone blocks. The Franconia is a thick sand-sandstone unit with much glauconite in the lower part associated with medium to coarse silty sand. Many zones contain large quantities of round to sub-angular red-brown or purple quartzite pebbles derived from the Pre-Cambrian Baraboo range to the northeast. The upper Franconia consists of inter-bedded silty fine to medium sandstone, dolomite, and glauconitic silty sands. Fossil remains are mostly burrows or trails. The formation is about 130 feet thick.

Above the Franconia is the Cambrian Trempealeau formation 70 or 80 feet thick. The contact of the two formations is usually concealed by slope wash and vegetation, as are the lower dolomites and siltstones of the Trempealeau. The greater part of the formation is a fine to medium white to brown sandstone with occasional concentrations of Baraboo quartzite pebbles. Near the Prairie du Chien contact is a distinctive white orthoquartzite zone.

The succeeding Prairie du Chien formation is of Ordovician age. The formation is predominantly a magnesian limestone-dolomite. The lower part is a sandy dolomite and then becomes a rather uniformly bedded compact gray to gray-brown crystalline dolomite. Minor features include white to gray bands of chert and small algal colonies. Jointing is pronounced with two sets of joints at approximate right angles and perpendicular to the bedding planes.

The formation has a variable thickness between 30 to 60 feet since it was considerably eroded prior to the deposition of the succeeding St. Peter formation.

The St. Peter formation may be present in the watershed, but was not observed in place during limited field work. Some small upland areas at roadcuts have loose blocks of a compact white to yellow or red-brown sandstone which is unlike the Trempealeau sandstone and represents let-down weathered remnants of St. Peter outcrop.

The structure of the watershed is relatively simple with a general dip of the strata to the south. Some minor flexures may occur, but no faults or folds were observed.

Preliminary site examinations have been made at three sites. Detailed foundation and borrow area investigations were made at site 3, which was found to be quite satisfactory for a multiple purpose structure.

Site 1 has a broad gap with asymmetrical abutments--the left somewhat steep, the right gently concave. The site is on a permanent stream with good flow. Most of the area is cropped with a small amount of pasture adjacent to the stream.

No outcrops occur at site. Stratigraphically the site is in the upper Franconia formation. Borrow appears adequate in quality and quantity. Access is excellent and clearing and grubbing will be minor. An emergency spillway can be cut on the left valley slope and very little rock excavation will be necessary. A small amount of road must be re-located and a power line will have to be moved.

The foundation alluvium should have good bearing capacity, save for a five to six foot blanket of sandy silt and silts which may have to be partially removed. Embankment drains will be needed.

Site 2 has a broad gap with relatively steep asymmetrical abutments. The stream is permanent. Upper Franconia outcrops are above site, but no rock is exposed at centerline. Borrow is adequate in quality and quantity. The centerline has about four and one-half feet of black, slightly organic silts and small peat pockets for a width of about 125 feet. These materials have a low blow count. An emergency spillway cut on the right abutment will have some rock excavation. Access is excellent. Two poles of a power line and a telephone line will have to be relocated. A drain system will be needed near toe of dam and along the abutments to collect seep water. The alluvial fines which have poor bearing capacity should be removed.

Site 4 has a broad flat gap with moderately steep abutments. The centerline is in cropland and pasture--the pasture hummocky with occasional areas of standing water. State Highway 23 runs along the left abutment. Outcrops of Franconia occur at a centerline roadcut and above and below site. The Franconia at site is a fine to medium quartz sand and sandstone, interbedded with silty glauconitic sands and a few beds of dolomite. The stream is permanent with a good flow. Much of the flood plain centerline is underlain by black lightweight organic silts and small amounts of peat to a depth of at least five feet. These sediments have a poor bearing capacity. The emergency spillway will be located on the right abutment and at least one-third will be rock excavation.

Borrow is available and should be of good quality.

Some parts of Wisconsin 23 must be raised. Embankment and abutment drains are needed.

The low-blow-count organic soils must be removed across the centerline.

A drilling program is recommended at sites 1, 2, and 4 to determine lithology and profile of bedrock across the centerline, the thickness of overburden over bedrock on the abutments, to delineate areas of organic and poor bearing capacity soils in the flood plain and to obtain ground water levels.

Test pitting of borrow areas will be necessary for a more accurate quantitative estimate of borrow resources and to obtain samples for qualitative evaluation at a soils mechanics laboratory.

Cost of investigation is included in the estimate for engineering costs under installation services.

Erosion and Sedimentation

Field investigations of erosion and sedimentation were made in accordance with procedures in the Training Manual for Geologists, and Washington Technical Release No. 12, Procedure for Computing Sediment Requirements for Retarding Reservoirs.

Gullying is not considered a serious problem in the watershed and evaluation studies were not made. Several farm units have small gullies, but these can be controlled by land treatment measures.

Channel erosion above structure sites ranged from 0.07 to 0.1 feet per year of lateral bank cut, and sediment production from channel erosion averaged 0.027 acre-feet per year per square mile of watershed. A few stretches of stream may have a rate of lateral bank erosion as high as 0.15 feet per year at cutbanks above dam sites.

Below the sites channel erosion is more severe, particularly on the main stem of Honey Creek from Section 18, T10N, R4E, downstream.

Areas of severe streambank erosion are associated with past attempts at channel straightening by individual landowners. These attempts were sporadic in the early part of the century and intensified from the 1930's on. From the center of Section 18, T10N, R4E, which is above Reach H₁, to the end of Reach E in the SW $\frac{1}{4}$, Section 4, T9N, R4E, there are six segments of straightened channel totaling about 16,000 linear feet interspersed with five stretches of "natural" channel also about 16,000 linear feet.

Honey Creek now has a non-uniform channel going from short or long stretches of straightened ditch to a meandering natural channel. Local contractors who straightened channel segments did not evaluate the rather complex long-term effects of storm events, velocities, gradient changes, and the erosive potentials of varied bank and bed materials. As a result, the products of lateral bank erosion have taxed the carrying capacity of the stream and the entrained deposits are lagging.

Channel erosion studies were made from above Reach H₁ to the end of Reach E. Bank condition, composition of bank, bedload, and seeps were studied. Shallow channel probes and bank borings were made.

The creek has a length of about 32,000 linear feet in this area, with four types of flood plain deposits adjacent to the channel.

About 30 percent of the channel length is in soils mapped as alluvial undifferentiated, 60 percent in Boaz silt loam, five percent in Ettrick silt loam, and five percent in peat.

Average bank composition is about 75 percent silt, five to ten percent clay, 10 to 15 percent fine to medium sand, and small amounts of peat and gravel.

The streambed profile was studied in the straightened ditch Section 32, T9N, R4E, a distance of 4,680 feet. Results are summarized below.

The upper ten inches of streambed profile is a fairly loose fine to medium silty sand--an SM. Occasional granules or pebbles were found. Below this the profile is more variable, but mostly a gray to blue-gray silt with a trace of very fine sand and occasional clots or organic material. No peat beds were found. The last 1,500 feet of reach had ML-CL from about one foot in depth to three feet, blue-gray silty clay or clayey silt that was quite stiff.

A drilling program is recommended to delineate the streambank and streambed profile in the area to be channeled. This will furnish an accurate profile of sediments to the depth of proposed channel cut and samples will be collected for laboratory analysis.

The conclusion reached is that haphazard ditching has changed the natural grade of the channel into a series of reaches with varied gradients. The initial effects of ditching were accelerated degradation of the channel bottom and lateral bank erosion. Sediment production became high and the stream was unable to remove a bedload which slowly accumulated as a channel plug deposit. The situation was further aggravated by the gradual reduction in capacity of the bridge crossing at county B. The bridge contributed to channel plugging by blockage during storm episodes when uprooted trees, fence posts, and other debris were trapped behind the bridge.

Upland sheet erosion computations were determined by the slope practice formula modified for Cornbelt States. Data for capability classes, land use, practices, and rotations was furnished by the work unit conservationist, Sauk County Soil and Water Conservation District.

Site 1 has an area of 2,142 acres--897 acres of cropland, 810 acres of pasture, 356 acres of woodland, and 79 acres of roads and buildings. Soil loss from sheet and channel erosion is 1,721 tons per year.

Site 2, with an area of 2,560 acres, has 1,099 acres of cropland, 1,069 acres of pasture, 319 acres of woodland, and 73 acres of roads and buildings. Soil loss from upland and channel erosion is 1,914 tons per year.

Site 3, 4,253 acres, has 1,831 acres of cropland, 1,550 acres of pasture, 1,032 acres of woodland, and 110 acres of roads and buildings. Sediment production to site from sheet and channel erosion is 2,320 tons per year.

Site 4 has an area of 2,910 acres, of which 1,193 is cropped, 877 in pasture, 746 in woodland, and 94 acres in roads and buildings. Sediment production from upland sheet erosion and channel erosion amounts to 1,835 tons per year.

Economics

Basic data for the computation of average annual damage was obtained by interview. Farmers and local Soil Conservation Service representatives were consulted to establish crop, pasture, and other agricultural damages. The farmers interviewed owned or rented land located entirely or partially within the watershed.

Information to determine stage-area-damage relationships for other agricultural, road and bridge, and urban damages was acquired by interview with affected residents, local officials, and Sauk County Soil Conservation Service technicians.

Additional sources of information were utilized to establish current unit costs for farm custom rates, fertilizers, fencing materials, and unit costs for highway construction equipment. Agencies consulted were the Federal-State Statistical Reporting Service, Soil Conservation Service, Wisconsin State Highway Commission, and the University of Wisconsin College of Agriculture.

The evaluation of floodwater damages to crops and pasture was based on Milwaukee E&WP Unit Economics Memorandum No. 3 (Revised), Evaluating Floodwater Damages to Crops and Pasture. Damage values for each crop (corn, oats, hay, and pasture) were determined for 0-2 feet and over 2 feet depth categories by months. These monthly values were then weighted by the percent of floods which occur during each month of the growing season and totaled to determine an annual damage value.

Annual damage values for corn, oats, and hay were then converted into a composite flood plain crop acre. The damage value per composite crop acre and pasture acre in each depth category was applied to the acres inundated as computed by the hydrologist for the 100, 50, 25, 10, 5, and 2 year frequency floods. These damages were then converted to an average annual basis by developing damage-frequency-of-occurrence graphs for "without" and "with" project conditions.

In addition, it was estimated that the recurring damage from floodwater would be 15 percent of the total direct average annual crop and pasture damage. A special study also indicated that an adjustment factor of plus 15 percent must be added to account for the most damaging flood each year exceeding the largest flood in damage.

Damages were computed for the following conditions:

1. Without project
2. With planned land treatment measures only
3. With land treatment and floodwater retarding structures
4. With land treatment, floodwater retarding structures and channel improvement

The reduction in damages by project measures was considered the damage reduction benefit (Table 5).

Other agricultural damages such as damage to fences, buildings, farm roads, farm bridge crossings and costs incurred to remove debris were determined by interview. This information made it possible to compute an approximate damage per acre for the large, medium and small frequency floods. These damages were converted to average annual by the use of damage-frequency curves for without and with project conditions. Benefits were derived by subtracting remaining average annual damages with project installation from average annual damages without project. Included were recurring damages of 15 percent of total direct damages.

Floodwater damage to public roads and bridges was based on information obtained by interview with town and county officials and local residents. Historic and anticipated damages were determined for each road or bridge location subject to floodwater damage. These facts were utilized to develop damage-frequency-of-occurrence curves to obtain average annual damages and remaining damages with project installation. Recurring damages of 15 percent of total direct damages were included.

Field surveys and interviews with local businessmen were made to determine the type, extent, and location of damages in the village of Plain. From this data a stage-damage curve was developed and related to frequency to obtain average annual damage without project. The change in stage for given frequencies "with" project provided the benefits as a result of the works of improvement. Recurring damages of 15 percent of direct damages were included.

Indirect damages otherwise unaccounted for in the evaluation of floodwater damages were estimated at 10 percent, 20 percent, and 15 percent, respectively, of total agricultural, road and bridge, and urban damages. Examples of indirect damages are loss in milk production, time lost waiting for floodwater to recede, expense of extra travel around flooded areas, and other personal inconveniences.

Benefits from restoration of former productivity and land use conversion were computed on the basis of the reduction in frequency of flooding with project. This study was based on Milwaukee E&WP Unit Economics Memorandum No. 5 (Revised).

Restoration of former productivity in Plain-Honey Creek applies to land that was formerly used for crop production but is presently utilized as pasture because of advance effects of flooding. Installation of flood prevention measures will reduce the flood hazard and induce farmers to restore this land to cropland consistent with its former productivity. Loss of former productivity is considered to be a floodwater damage. Therefore, benefits from restoration of former productivity are included as flood prevention damage reduction benefits. Land use conversion in the watershed is applicable to land that has never been in cultivation due to the hazard of frequent flooding but will be put into cultivation as a result of the project.

Land acres subject to benefits from restoration of former productivity and land use conversion were considered as the difference with and without project in the number of pasture and idle land acres that flood on the average of once in five years.

Furthermore, the expected intensity of cropping on newly protected land eligible for conversion was assumed to be comparable to the intensity of cropping on flood plain land having five-year frequency flood protection without project. Land acres that will actually be converted as a percent of the total land acres eligible for conversion was determined by field inspection and interviews with farmers in the flood plain. Total watershed acres to be restored to cropland was estimated at 103. Land use conversion is expected to occur on 73 acres. This land has always been pasture or idle but will be cropped following installation of flood prevention measures.

The net benefit per acre from restoration and conversion was determined by computing the composite crop value less production costs, less remaining flood damages from the 10, 25, 50, and 100 year frequency storms, less cost of preparing land for production, and less annual net income from the land in its present use as pasture. Additional fencing costs were included in land preparation costs.

Based on a corn-corn-corn-oats-hay rotation, the future net benefit per acre restored and converted will range from \$21.32 to \$25.78 per acre, depending on land preparation costs, damages remaining with project, and present pasture values for individual evaluation reaches.

On the basis of interviews with farmers in the flood plain it was estimated that approximately 20 percent of the land restoration and conversion will occur within the five-year project installation period and 60 percent will occur during the first five years after project. The remaining 20 percent will take place during the second five years following project installation. Restoration and conversion benefits per acre in each reach were discounted for this lag in accrual.

A typical reach evaluation of changed land use benefits is shown in the following calculations:

Evaluation Reach B

Present Net Income Based on Flood-Free Yields

| <u>Land Use</u> | <u>Yields</u> | <u>Net/Acre</u> | <u>Acres</u> | <u>Net Return</u> ^{1/} |
|-----------------|---------------|-----------------|--------------|---------------------------------|
| Corn | 95 bu. | \$71.88 | 67 | \$4,816 |
| Oats | 60 bu. | 34.99 | 22 | 770 |
| Hay | 3 T. | 15.45 | 45 | 695 |
| Pasture | 65 CPD | 10.40 | 293 | 3,047 |
| | | | <u>427</u> | <u>\$9,328</u> |

Future Net Income Based on Flood-Free Yields

| <u>Land Use</u> | <u>Yields</u> | <u>Net/Acre</u> | <u>Acres</u> | <u>Net Return</u> ^{1/} |
|-----------------|---------------|-----------------|--------------|---------------------------------|
| Corn | 95 bu. | \$71.88 | 104 | \$7,476 |
| Oats | 60 bu. | 34.99 | 34 | 1,190 |
| Hay | 3 T. | 15.45 | 70 | 1,082 |
| Pasture | 65 CPD | 10.40 | 219 | 2,278 |
| | | | <u>427</u> | <u>\$12,026</u> |

| | |
|---|---------|
| Increased net return with project | \$2,698 |
| Less land development costs | 710 |
| Less remaining damages from floodwater | 92 |
| Less discount for time lag in accrual of benefits | 137 |

Average annual net benefit \$1,759

1/ Price base - Projected long term

Increased production of corn, oats, and hay due to flood plain land use conversion from pasture and idle land to cropland will bring about desirable land use adjustments and increase farm efficiency. About one-half of the farmers interviewed in the flood plain indicated they will eventually go to a green feeding program with the availability of additional cropland. This will reduce pasture requirements and support more animal units per farm.

It was also evident from interviews that most farmers who do not anticipate going to a green feeding program will increase livestock units per farm to some extent with availability of additional cropland. These farmers will crop the converted land in the flood plain and pasture the less productive land (presently cropped) outside the flood plain.

For these reasons it seems logical to assume that little or none of the increased production from land use conversion will go into commercial channels.

Local secondary benefits were computed in accordance with Watersheds Memorandum SCS-57: (1) Local secondary benefits were considered as 10 percent of the total primary benefits from floodwater damage reduction to crops and land use conversion and (2) additional local secondary benefits were considered as 10 percent of the increased costs that will be incurred by producers in connection with increased production. In the latter case secondary benefits were computed for increased costs associated with increased production on land restored and converted from pasture and idle land to cropland. This cost based on a composite acre ranged from \$51.31 to \$57.86, depending upon land conversion costs for individual evaluation reaches.

All current prices used to analyze floodwater damages and computed benefits were converted to projected long term prices based on 1962 indices compiled by the United States Department of Agriculture. Project operation and maintenance costs were similarly converted to projected long term prices based on 1962 price indices. To estimate the costs of all structural and land treatment measures 1963 prices were used.

Structure 3 is a multiple reservoir type structure for floodwater retention and recreational development.

The period of intensive park use will be between the period from Memorial Day through Labor Day. There will be weekends, both before and after these holidays, in which a limited amount of visitation will occur. This visitation was not evaluated.

To determine the visitor-use days for this recreational site, 26 days of weekend visitation and 60 days of weekday visitation were used. The capacity at any one time in the area for all types of recreation is estimated at 905 people. Weekday capacity is estimated at 50 percent of the possible use, or 452.5 visitors per day. With 60 weekdays at 452.5 visitors per day, total visitor weekdays per season will be 27,150. Visitor capacity on Saturdays and Sundays is estimated at 100 percent, or 905 visitors per day. At this rate for 26 weekend user days total seasonal weekend visitor days will be 23,530. Combining weekdays and weekends, visitor days per year will total 50,680. At \$1.50 per visitor day for fully developed recreational facilities, total recreational benefits from site 3 will be \$76,020.

Land Treatment Measures

Land treatment measures to be applied on cropland and pasture areas during the project period were based on the application of procedures given in Advisory Notice W-478, except that a sampling of basic soil and water conservation plans forms the basis for measuring land treatment

needs. Composite-acre unit costs were based on unit planning and installation costs applicable in the Sauk County Soil and Water Conservation District. A copy of basic data, computations, and cropland and pasture acres to be treated are on file in the Soil Conservation Service office.

The U. S. Forest Service and the Wisconsin Conservation Department made an inventory of forest resources, conditions, and needs. The Bureau of Sport Fisheries and Wildlife of the Fish and Wildlife Service made a study of the area.

With this data the district supervisors and watershed directors, in consultation with technicians from all interested agencies, determined the conservation practices to be installed during the project period. These measures will have a measurable hydrologic effect on runoff.

The reports of the Forest Service and Fish and Wildlife Service are included in the appendix to this plan.

Recreational Development

The recreational development plan for site 3 was prepared by the three-man technical committee. The technical committee consists of a representative from the Soil Conservation Service, State Soil and Water Conservation Committee, and the Wisconsin Conservation Department. This committee coordinated the development with the local sponsoring organization.

A field investigation was made to determine recreation potential and the most feasible location for a recreation development in the watershed. Site 3 was found to be the most suitable location for this type of development.

A multipurpose floodwater retarding and recreation structure with a permanent lake of 104 surface acres is planned. A draw-down device to draw cold water from the lower levels of the conservation pool will be provided.

The lake, rectangular in shape, will be approximately 4,000 feet long and average 1,000 feet in width with approximately 10 acres in the V-shaped area on the west side.

Three locations have been designated for picnic areas as follows: (1) 30 acres immediately below the reservoir, (2) 5 acres west of the V-shaped lake and (3) 10 acres at the north end of the lake. Each picnic area will have parking stalls, a well, picnic facilities, shelter house and appurtenances.

There will be a 15-acre 60-unit camping area in the northeast corner of the park. This area will have its own sanitary facilities, well, and picnic tables. There will be good access to the lake.

A two-acre swimming beach area will be located on the west side just upstream from the structure. A shelter house, changing stalls, etc., will be built at the swimming beach. On the north end of the lake a two-acre boat launching area with a ramp and 10-car trailer parking area is planned.

Cost of Facilities

The three-man technical committee developed guidelines for the determination of installation, replacement, operation, and maintenance cost for basic facilities. These guidelines were used to plan the basic facilities for this recreational development.

Use-of-facilities method was used for cost allocation between flood prevention and recreational development at structure 3. All identifiable and specific structure costs for recreation in structure 3 were allocated directly to recreation. The total cost for the multiple purpose structure and recreational development is estimated at \$529,976, of which \$95,824 is allocated to flood prevention and \$434,152 is allocated to recreation.

Of the \$434,152 allocated to recreation, \$185,591 will be borne by P.L. 566 funds and \$248,561 will be borne by other funds.

The estimated P.L. 566 cost of \$185,591 will pay 50 percent of the:

| | |
|---|----------------------|
| 1. Structure construction allocated to recreation | \$ 58,287 |
| 2. Land, easements, and rights-of-way | 13,214 ^{1/} |
| 3. Basic facilities construction | 76,963 |
| 4. Engineering for basic facilities | 5,100 |

and 100 percent of the:

| | |
|---|--------|
| 1. Structural engineering | 22,904 |
| 2. Structural installation and services | 9,123 |

| | |
|--|-----------|
| Total P.L. 566 cost for recreation increment | \$185,591 |
|--|-----------|

^{1/} Not to exceed 50 percent of purchase cost on lands eligible for P.L. 566 cost sharing.

The estimated other recreational cost amounting to \$248,561 is the responsibility of the Sauk County Soil and Water Conservation District. The State Soil and Water Conservation Committee has agreed to furnish an estimated \$118,000 to the sponsoring organization for assistance in the development.

The State Soil and Water Conservation Committee under Section 92.18 of the Wisconsin Statutes will bear the estimated cost for:

| | |
|---|-----------|
| 1. Structure construction allocated to recreation | \$ 43,715 |
| 2. Land, easements, and rights-of-way | 74,285 |
| Subtotal for SSWCC | \$118,000 |

The Wisconsin Conservation Department has agreed to furnish an estimated \$6,160 to the sponsoring organization for assistance in the development as follows:

| | |
|---|----------|
| 1. Road construction to navigable waters | \$ 3,600 |
| 2. Boat ramp | 1,000 |
| 3. Car-trailer parking | 1,200 |
| 4. Engineering and services for road construction | 360 |
| | <hr/> |
| Subtotal for WCD | \$ 6,160 |

Of the other \$248,561 estimated cost, the local sponsoring organization will be responsible for an estimated \$124,401. This amount will be for items as follows:

| | |
|---|-----------|
| 1. Structure construction allocated to recreation | \$ 14,572 |
| 2. Administration of contracts | 2,014 |
| 3. Land, easements, and rights-of-way | 31,052 |
| 4. Recreational facilities | 71,163 |
| 5. Administration, engineering, legal fees & services | 5,600 |
| | <hr/> |
| Subtotal | \$124,401 |

Operation, replacement, and maintenance cost for the recreational facilities has been developed by the three-man technical committee. These costs include maintenance for upkeep of the facilities, replacement of facilities at end of expected life, and operation cost during the summer months for custodian, equipment, and lifeguard. The operation and maintenance cost breakdown is as follows:

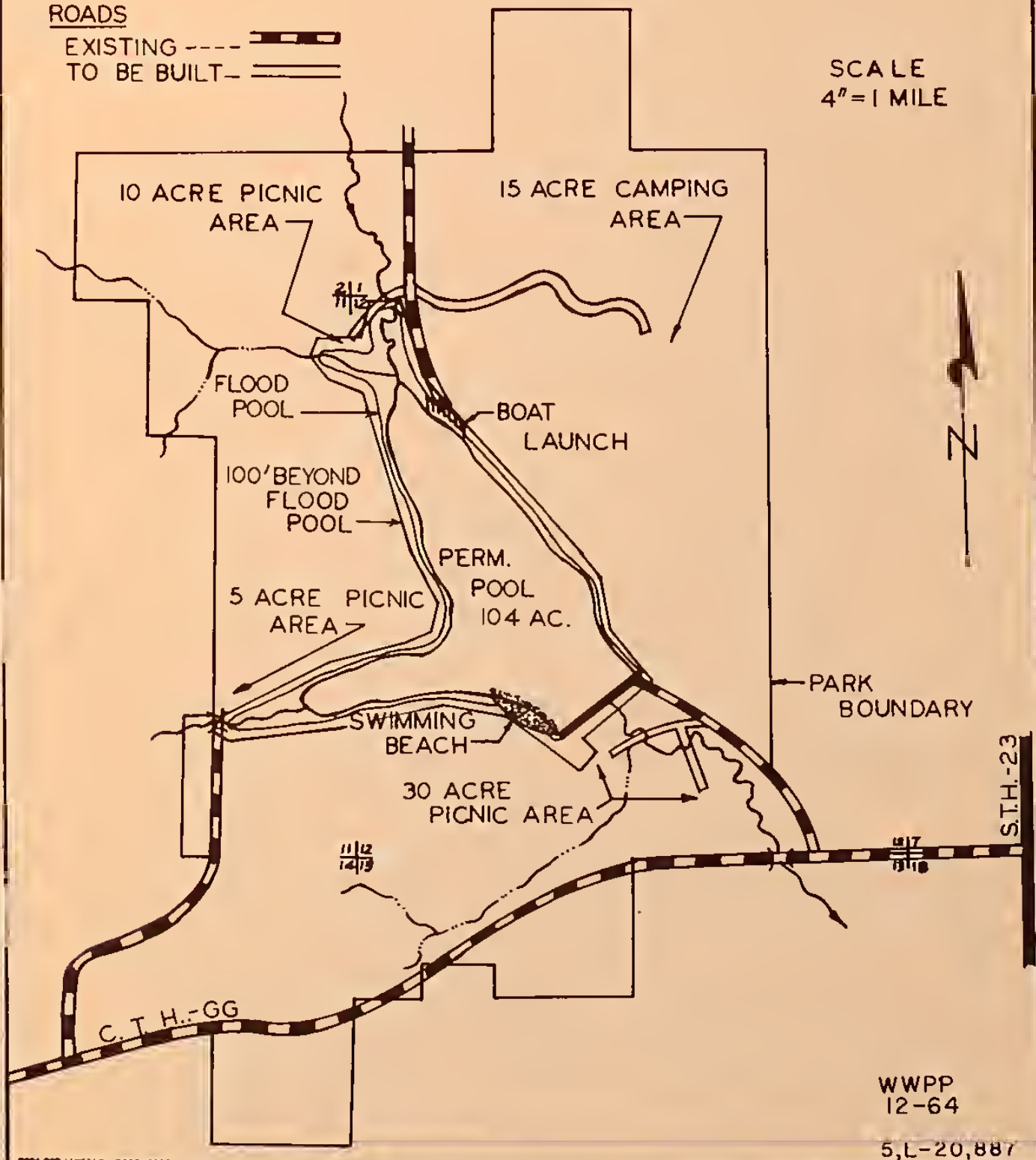
| | |
|---|----------|
| Average annual operation and maintenance of structure | \$ 400 |
| Average annual maintenance of recreation facilities | 4,104 |
| Average annual replacement cost of basic facilities | 6,008 |
| Average annual operation of basic facilities | 4,000 |
| Custodian - \$1,200 per season | |
| Equipment - \$1,000 per season | |
| Lifeguard - \$1,800 per season | |
| | <hr/> |
| Total average annual operation and maintenance cost | \$14,512 |

PLAIN-HONEY CREEK W.S. SITE NO. 3

ROADS

EXISTING - - - - -
TO BE BUILT - - - - -

SCALE
4" = 1 MILE



PLAIN-HONEY CREEK WATERSHED
SAUK COUNTY, WISCONSIN

LEGEND

- CIVIL TOWNSHIP LINE
- U.S. TOWNSHIP LINE
- SECTION LINE
- SECTION NUMBER
- AVOID ROAD
- DIRT ROAD
- FARM ROAD
- BRIDGE, ROAD
- HOUSE
- SCHOOL
- CHURCH
- CITY
- CITY
- PERENNIAL STREAM, SMALL
- INTERMITTENT STREAM
- STREAM DISAPPEARS ON FLAT
- SAUNA
- ADDER LINE
- GRAVEL PIT, QUARRY OR MINE
- WATERSHED BOUNDARY
- DRAINAGE AREA CONTROLLED BY STRUCTURE
- FLOODWATER RETARDING STRUCTURE
- MULTIPLE PURPOSE STRUCTURE
- CHANNEL IMPROVEMENT FOR FLOOD PREVENTION
- AREA BENEFITED
- DIKE
- STRUCTURE NUMBER
- DRAINAGE AREA ACREAGE
- EVALUATION REACH

Scale
0 1 2 Miles

Location in Wisconsin

A P P E N D I X

UNITED STATES DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife
1006 West Lake Street
Minneapolis 8, Minnesota

October 31, 1962

State Conservationist
Soil Conservation Service
3010 E. Washington Avenue
Madison, Wisconsin

Dear Sir:

The Bureau of Sport Fisheries and Wildlife, in cooperation with the Wisconsin Conservation Department, has completed a field reconnaissance of the proposed Plain-Honey Creek Watershed project, Sauk County, Wisconsin. This report, concurred in by the Wisconsin Conservation Department, has been prepared in accordance with the provisions of Section 12 of the Watershed Protection and Flood Prevention Act (68 Stat. 666), as amended.

The watershed contains some 45,500 acres within 243 farm units. It is located in unglaciated southwestern Wisconsin where the topography is characterized by narrow ridges, steep slopes and a flat valley.

We participated in the Task Force field examination of the watershed on October 31 and November 1, 1960. We concur with the remarks in the "Fish and Wildlife Values" section of the Task Force report.

The proposed floodwater retarding structures will reduce flash flood crests in the principal drainageways. This reduction would permit development of streambanks and channel stabilization measures for improvement to fish and wildlife. Streambank and springhead fencing for the protection of the waterway, and game habitat development will be of major importance to additional improvement. Also, the lower valley contains many wet areas, most of which should receive protection for the benefit of wildlife resources.

Further study of this project area by the Bureau of Sport Fisheries and Wildlife is not deemed necessary. We appreciate the cooperation and assistance of your staff.

Sincerely yours,

/s/ W. P. Schaefer

W. P. Schaefer
Acting Regional Director

STATE OF WISCONSIN
CONSERVATION DEPARTMENT
Box 450
Madison 1

October 19, 1962

Mr. R. W. Burwell, Regional Director
Bureau of Sport Fisheries and Wildlife
1006 West Lake Street
Minneapolis 8, Minnesota

Dear Mr. Burwell:

We appreciate the opportunity to review the reconnaissance report you plan on submitting to Mr. Marvin Schweers, State Conservationist, concerned with the Plum Creek Watershed, Blackhawk-Kickapoo Watershed, Halls Branch Watershed, Plain-Honey Creek Watershed, and Knights Creek Watershed.

We have carefully reviewed your reports and we agree completely with all statements you have made. Your recommendations are in accordance with agreements reached by your representative and our representative during the task force review investigations.

Recently our State Soil and Water Conservation Committee appointed a three-man group of technicians, one from the State Committee, one from SCS and one from our department, to investigate the feasibility and prepare recommendations on fish, wildlife and recreational aspects of watershed projects. This committee group will be working closely with the watershed work party as they prepare the work plan on each of the above watersheds.

Very truly yours,

/s/ L. P. Voigt
Conservation Director

UNITED STATES DEPARTMENT OF AGRICULTURE

Forest Service

WORK PLAN FOR FORESTRY PROGRAM

on

PLAIN-HONEY CREEK WATERSHED

WISCONSIN

June 1962

I. Watershed Location and Description

The Plain-Honey Creek Watershed is located in Sauk County, Wisconsin. Honey Creek drains into the Wisconsin River at a point about four miles below Sauk City, Wisconsin. The watershed is approximately fifteen miles long and five miles wide and contains about 45,500 acres.

The Town of Plain and the Villages of Blackhawk, Witwen, and Loreta are within the watershed.

Land classification is subject to revision and is approximately as shown. Some change can be expected in the woodland figures as steep, poorly stocked wooded pastures become woodlands. Some present woodland on productive soils might become agricultural land resulting in additional change.

| <u>Use</u> | | <u>Acres</u> | <u>Percent</u> |
|-------------------------------|--------------|---------------|----------------|
| Cropland | | 17,400 | 38 |
| Pasture | | 11,750 | 26 |
| Woodland - Manageable Acreage | 8,450 | 14,200 | 18 31 |
| Other Woodlands | <u>5,750</u> | <u>13</u> | <u>5</u> |
| Other | | 2,150 | |
| | | <u>45,500</u> | <u>100</u> |

There are 243 farms in the watershed. About 109 or 45 percent of the landowners are cooperators. Basic farm plans have been prepared for 89 farmers. Practices are found installed on another 27 farms whose owners are not cooperators with the soil and water conservation district.

The agriculture is principally dairying with associated swine and some beef production. Crops are corn, hay, and oats and other feed (grains) crops. Farm buildings are notably well kept. Land ownership is private.

The area is characterized by a broad valley floor with rolling to steep slopes and narrow ridges. Elevations vary from about 780 feet at the outlet to about 1,200 feet at the upper end. The bottomlands consist of Ettrick silt loams and peat and muck soils. Hixton loams and Gale silt loams are found on valley slopes and Dubuque silt loams are found on the ridges.

Watershed problems include substantial floodwater and sediment damage to roads and bridges, farm pasture and croplands and to some extent, buildings in the Plain village. Poor drainage and excessive erosion

of some agricultural lands are considered substantial problems. The extensive grazing of woodlands has undoubtedly contributed to sheet erosion in the woodlands and adjacent lower fields.

II. Procedure

Woodland areas were entered on a copy of the watershed base map using 1955 aerial photos as a guide. Acreage of woodlands was obtained by using a dot grid directly on the aerial photos. Some difficulty in determining the area of woodland was encountered due to the large amounts of inadequately stocked grazed wooded areas. Many of these are on sites capable of being maintained safely as a pasture and some attempt was made to not include these as woodland. A crown density of 15-20 percent was considered as the approximate breaking point. A cruise was then designed establishing 26 study plots involving 156 measurements of hydrologic condition factors.

Timber types, conditions, and volumes were observed and determined for each plot. Past treatment and management needs were recorded. The data was summarized, analyzed and developed through standard calculations into the program which follows.

Preliminary participation estimates of forest land treatment measures which may be attained during the installation period were arrived at in consultation with the Assistant District Forester and the Work Unit Conservationist in the county. Final decision on measures and amounts to be included in the work plan will eventually be determined in consultations with the watershed sponsoring organizations.

III. Woodland Condition Summary - 8,450 Acres

Timber types are chiefly oaks with some mixed hardwoods. Some areas of aspen were also noted.

| <u>Stocking</u> | <u>Oak</u> | | <u>Other</u> | |
|--------------------|--------------|----------------|--------------|----------------|
| | <u>Acres</u> | <u>Percent</u> | <u>Acres</u> | <u>Percent</u> |
| Well stocked | 650 | 8 | 490 | 6 |
| Moderately stocked | 2,600 | 30 | 2,600 | 30 |
| Poorly stocked | 1,460 | 18 | 650 | 8 |
| | <hr/> | <hr/> | <hr/> | <hr/> |
| | 4,710 | 56 | 3,740 | 44 |
| | <hr/> | <hr/> | <hr/> | <hr/> |
| | Total | | 8,450 | 100 |

There are 5,750 acres of area now classified as woodland but heavily pastured and in need of a decision on optimum land use. An increase of 2,000 acres in total actual woodland area might be expected from a decision on this use. This would be included in the area protected from livestock.

Cutting History

| <u>0-10 Years Past</u> | <u>Acres</u> | <u>Percent</u> |
|------------------------|--------------|----------------|
| Little or none | 6,495 | 76 |
| Light | 490 | 6 |
| Moderate | 325 | 4 |
| Severe | 1,140 | 14 |
| | <hr/> | <hr/> |
| | 8,450 | 100 |

Merchantable Volume

Average Net MBF Per Acre

| | | |
|-----|-------|-------|
| 0-2 | 6,830 | 80 |
| 3-5 | 1,460 | 18 |
| 6+ | 160 | 2 |
| | <hr/> | <hr/> |
| | 8,450 | 100 |

Grazing Damage

| | | |
|----------|-------|-------|
| None | 2,290 | 28 |
| Light | 2,100 | 24 |
| Moderate | 1,770 | 20 |
| Severe | 2,290 | 28 |
| | <hr/> | <hr/> |
| | 8,450 | 100 |

Most of this timber is in the red oak group, moderately to lightly stocked and in small diameter classes. The average merchantable volume was 2.6 MBF on those plots considered merchantable. This volume is mostly growing stock, not having reached harvest proportions.

Grazing evidence was observed in 72 percent of the stands. Changes in land use and the farm economy have reduced the area exposed to live-stock to 52 percent (see total needs).

If the areas receive protection from grazing then the growing stock can be carried to maturity and provisions for regeneration and stand improvement will successfully maintain the woodlands resulting in contributions to the economy and the watershed.

The watershed is located within a Cooperative Forest Fire Protection District. No evidence of recent fires was observed.

IV. Needed Forestry Program for Watershed Protection - 8,450 Acres

At present the hydrologic condition of the woodland area is 2.6 or medium poor hydrologic condition. The planned program should increase this to 3.1 which is low average or fair condition. The maximum improvement would be to 3.7 or high average or fair hydrologic condition.

The total needs for forestry include:

| <u>Practice</u> | <u>Acres</u> |
|-------------------------------|--------------|
| Livestock exclusion | 4,350* |
| Sustained yield management | 1,600 |
| Timber stand improvement | 1,900 |
| Tree planting (reinforcement) | 335 |
| Tree planting (open field) | 500 |

*Some areas need a combination of practices while others need none.
A total of this column shows total acres of treatments only.

Any one or a combination of these measures applied where the technician recommends will not only improve the hydrologic condition of the woodland area but will result in improved land values and monetary returns to owners from lands otherwise not paying their way.

The following list describes each of the practices as applied by the Forester:

1. Livestock Exclusion (Protection From Grazing)

This measure consists of excluding all farm livestock permanently from woodlands. To accomplish this may require fencing all or a part of the woodland. It also may be accomplished by a permanent change in use of adjacent agricultural land.

Grazing by livestock has a damaging effect on the hydrologic condition of the woodlands. The litter and humus layers are destroyed or compacted which greatly reduces their ability to absorb water and to retain and detain it. As a consequence, the amount of runoff is increased. In addition, grazing destroys young growth and mature trees reduces the productivity of the woodlands and the quality of forest products.

Technical assistance is needed to inform and demonstrate to woodland owners the effects of woodland grazing from the standpoint of low forage yield for livestock and damage to woodlands resulting in poor hydrologic condition and reduced economic value.

2. Sustained Yield Management (Protection From Overcutting and Damaging Logging)

This measure accomplished through proper management of woodlands establishes a permanent forest cover adequately stocked with desirable species of suitable age classes.

In young stands, a sustained yield management plan defines and schedules the improvement and protection measures needed to develop a thrifty fast growing woodland with good species. In woodlands having merchantable timber, proper harvesting of timber crops according to the best sustained yield practices will result in improvement

and maintenance of an effective forest cover with good species composition, density, and age class conditions.

Use of proper logging methods and layout of roads in the woodlands with due regard to the topography and soil will help prevent harmful effects of the harvesting operation due to erosion and runoff.

These factors will assure maintenance and improvement of the hydrologic condition and of the productive capacity of the woodlands.

Technical assistance is needed for education and assistance in preparing woodland management plans, in marking trees to be harvested, utilization and marketing of products, and the proper logging methods.

3. Timber Stand Improvement (Hydrologic Stand Improvement)

This practice consists of the conventional timber stand improvement measures with special emphasis on improving the hydrologic condition of the woodland. Diseased, defective, poorly formed and otherwise undesirable trees are eliminated from the stand by cutting, poisoning or girdling to improve species composition, stand density and rate of growth. At the same time it is important to maintain the proper level of stocking.

Timber stand improvement will increase yields and produce higher quality products. It will help to insure that the land will remain in woodland, be managed and protected, thus contributing needed hydrologic benefits.

Technical assistance is needed to determine the needs of various woodlands for treatment, type of treatment needed, and methods to be used, as well as for demonstration purposes in marking trees which should be removed.

4. Tree Planting (Reinforcement)

This practice consists of planting trees in openings of thinly stocked woodlands to bring them to the proper stocking level and to improve their hydrologic characteristics. A fully stocked stand of desirable tree species is the objective.

Technical assistance is needed to advise woodland owners of the need for fill-in planting, the proper tree species to plant and the best planting methods to use.

5. Tree Planting (Open Field)

This measure consists of planting suitable species of trees on open land for the establishment of a forest stand. Planting is recommended for land better suited to woodland than to agriculture, that is, land with steep topography, depleted fertility, presence of rocks, brush, erosion, or other factors.

The purpose of the measure is to improve hydrologic condition by the establishment of a forest cover and achieve better land use. This will build up litter and humus and create conditions which will contribute to better infiltration, retention and detention capacity, reduced runoff and soil stabilization.

Technical assistance is needed to help the landowner select areas to be planted and species and methods to be used in planting.

V. Planned Program for Watershed Protection - 8,450 Acres

The following table shows need and expected participation and accomplishment during the five year installation period. These estimates presuppose that adequate technical assistance will be available to build and carry through an accelerated program and that a high level of cooperation will be shown by local groups and assisting agencies.

| Practice | : : Needed : Program : (acres) | : : Estimated : Partici- : pation : (percent) | : : Planned : Program : 5 Years : (acres) | : Est. Accomp. : by Going : Program : 5 Years : (acres) | : Balance for : Watershed : Project : 5 Years : (acres) |
|--|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| G. Livestock Exclusion | 4,350 | 30 | 1,300 | 450 | 850 |
| C. Sustained Yield Management | 1,600 | 72 | 1,150 | 150 | 1,000 |
| H. Timber Stand Improvement | 1,900 | 11 | 175 | 50 | 125 |
| P _f . Tree Planting (Reinforcement) | 335 | 3 | 10 | 3 | 7 |
| P _o . Tree Planting (Open Field) | 500 | 10 | 50 | 20 | 30 |

Column (1) is based upon total needs as determined by field observations.

Columns (2), (3), and (4) were determined through consultation with the Work Unit Conservationist and Assistant District Forester and reflects their knowledge of what they can expect from the landowners in the watershed.

Column (5) shows the accomplishment planned for the five year installation period by the accelerated P.L. 566 program.

Project Installation Assistance

Technical assistance for the forestry measures will be furnished by the Forest Management Division of the Wisconsin Conservation Department in cooperation with the U. S. Forest Service. The measures will be installed by private landowners and operators. Technical assistance will be provided under an accelerated program by the District Forester and his assistants, and financed by State funds and matching P.L. 566 funds.

Project Maintenance Assistance

Program measures after completion of the P.L. 566 project will be maintained by the landowners and operators with technical assistance provided by the Forest Management Division in cooperation with the U. S. Forest Service under the Cooperative Forest Management Program.

VI. Hydrologic Significance

Soils in the forested area are predominantly in hydrologic soil group B which is that group having average infiltration properties after pre-saturation.

Present hydrologic condition class is 2.6 with a corresponding runoff/precipitation curve No. 67. This indicates a medium poor hydrologic condition.

Installation of the measures programmed above will bring the average future hydrologic condition during the next 50 years to a class of 3.1 with a corresponding runoff/precipitation curve of 63. This is a low average or fair hydrologic condition.

VII. Cost of Program Installation

Unit cost estimates are based on state and local averages for similar work with adjustments to provide for an accelerated program.

| | <u>Cost/Acre</u> |
|--|-------------------|
| G. Livestock exclusion | \$ 6.00 |
| C. Sustained yield management | 1.00 |
| H. Timber stand improvement | 16.00 |
| P _f . Tree planting (reinforcement) | 45.00 |
| P _o . Tree planting (open field) | 35.00 |
| Technical assistance for Forestry Measures | 2.77 average/acre |

Table 1 prepared on the basis of P.L. 566 estimated participation is attached. Table 1a showing measures currently installed is also attached.

TABLE 1 - ESTIMATED INSTALLATION COSTS

For 5-year period

State: Wisconsin

Project: Plain-Honey Creek

| Installation Cost Item | : | : | : | Estimated Cost (Dollars) | | |
|---------------------------|----------------|------|------------------|--------------------------|----------------|--------|
| | | | | Number | | |
| | | | | Non-Federal | P.L. 566 Funds | Other |
| | Unit | Land | Non-Federal Land | | | TOTAL |
| <u>LAND TREATMENT</u> | | | | | | |
| Forest Service | G | Acre | 850 | 5,100 | | 5,100 |
| Land Treatment Measures | C | Acre | 1,000 | 1,000 | | 1,000 |
| | H | Acre | 125 | 2,000 | | 2,000 |
| | P _f | Acre | 7 | 315 | | 315 |
| | P _o | Acre | 30 | 1,050 | | 1,050 |
| Technical Assistance | | | | 2,845 | 2,725* | 5,570 |
| TOTAL LAND TREATMENT (FS) | | | | 2,845 | 12,190 | 15,035 |

STRUCTURAL MEASURESFlood Prevention

Forest Service
Land Stabilization
Waterflow Control

TOTAL FLOOD PREVENTION (FS)

G - Livestock Exclusion
C - Sustained Yield Management
H - Timber Stand Improvement
P_f - Tree Planting (reinforcement)
P_o - Tree Planting (field)

*Technical assistance costs by State used in matching the Federal P.L. 566 funds. State share increased 15% for overhead; Federal increased 20% for overhead.

March 1962

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of work plan preparation)

Plain-Honey Creek Watershed, Wisconsin

| Measures | Unit | Applied to date | Total Cost |
|--|------|--------------------|-----------------------|
| | | | Dollars ^{1/} |
| <u>LAND TREATMENT</u> | | | |
| *G. Livestock Exclusion | Acre | 1,800 | 10,800 |
| C. Sustained Yield Management | Acre | 150 | 150 |
| H. Timber Stand Improvement | Acre | 50 | 800 |
| P _f . Tree Planting (reinforcement) | Acre | 20 | 900 |
| P _o . Tree Planting (open field) | Acre | 60 | 2,100 |
| TOTAL | xxx | xxx | 14,750 |

^{1/} Price base - 1961

*Acreage estimates determined in consultation with
the Forester and Work Unit Conservationist.

July 1962

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